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Course of Study

Manual Training Department

of the
Elementary Public Schools,
Chicago.

Prepared by
H. F. Beardsley,
Director of Manual Training

1898-1899

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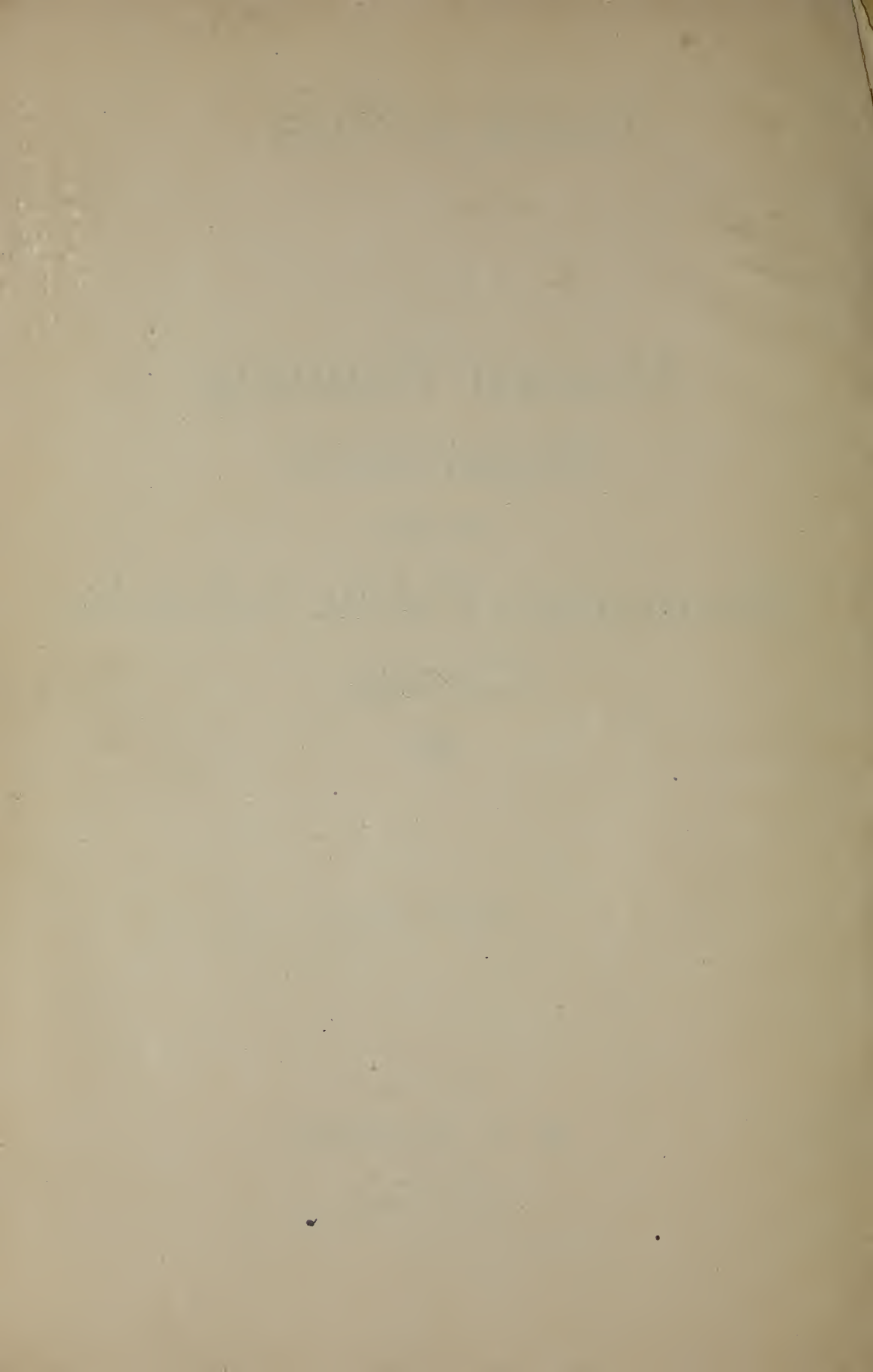
Course of Study.

Manual Training
Department
of the
Elementary Public Schools,
Chicago



1898-1899

Prepared by
R. F. Beardsley,
Supervisor of
Manual Training.



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HIS manual is designed as a guide to the teachers of constructive work in the Grammar Grades of the Chicago Public Schools.

The models shown are such as have proved of value in developing, not alone manual skill, but such as will tend to lead children to independent thinking.

No *set* of models can express the manual training idea, nor can any definite course of work be applicable to all of the diverse conditions to be met in one city or even in one school, consequently the courses shown are arranged merely as a temporary base from which to work. Considering that the development of the child morally and mentally is the object of education, then the acquisition of skill, which heretofore has been the dominant feature in manual training, will become incidental, and the exercise of the faculties in self-expression will become the basis for our work. Not that the training for skill is to be neglected, but it should not be fostered at the expense of the child's broad understanding of nature and nature's laws.

A closer relation between the work in the shops and the work of the grade teacher is desired in order to give life to the work of the shops, which should be considered in the light of *school laboratories* where the work of the class-room is to be more fully developed. The special teachers of manual training should keep in constant touch with the work of the grades and should, as far as possible, plan to have each lesson express in some way the work which is being carried on in the class-room. As an example I would suggest that in April, when the study of plant life is being made (see course of study p.p. 29,) that the manual training classes make small window-boxes. That when the study of birds and their flight is taken up, the construction of kites and boats occupy the attention of classes in the shops.

Play as a means of education has been shown to be most

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valuable in our vacation schools and in the Kindergarten. The construction of apparatus for games and plays will be found to bring our work in closer touch with the child's life. Several games shown among the models here presented will illustrate this idea.

Apparatus for scientific experiment and for physical culture opens another field for the development of the inventive faculty.

Work in wood alone is sufficient for a two or three years course but is not diversified enough for constructive work throughout the grades. In consideration of this I would advise the use of many materials and would recommend that in planning exercises teachers make use of any material which would be most fitted to the work. Clay, Paper, Cardboard, Tin, Wire, Twine and many other mediums may be used alone or in combination with wood to produce the articles or objects desired.

The directions for work herein given are not necessarily the ones which would be followed by a mechanic in constructing each object, but are arranged with the idea in view of a progressive development of the child mentally and physically. These directions are to be carefully followed by teachers, and the tools therein specified are to be used.

Each lesson is, in general, to be given in the following order:

FIRST: *Theoretical Instruction* as to necessary material and tools, and explanation of the nature and use of the particular exercise.

SECOND: *Drawing*. Free-hand sketching of teacher's model, and constructive drawing made from this sketch.

THIRD: *Demonstration* by the teacher, of the manner in which the object is to be made.

The theoretical instruction is to comprise and include descriptions of various kinds of woods and trees, their uses, and the reasons for same. Structure, growth and properties; the methods employed to prepare them for use, defects and their causes, as also the various means employed for preservation.

Tools are to be accurately and minutely described, and the historical development and utility of each particular part is to

be made clear. The nature, properties, origin and manufacture of the metals which compose the different implements, is to be indicated, with special reference to steel in its relation to iron, and how to harden it. *The sharpening and care of edged tools is to be taught at the time of their introduction into the work.*

The course in drawing will be given as follows:

In the case of objects made from one piece of thin wood, where but one view is required, no drawing is to be made. Pupils will under these conditions, work from the teacher's model, and from a blackboard drawing.

In the case of all objects requiring two or more views for their representation, pupils will in every case, make a free-hand sketch from the teacher's model, showing the *necessary* views and dimensions, except where otherwise indicated in the directions.

This sketch, after being approved by the teacher, is to serve as a basis for the finished working drawing. The pupil should be taught that this class of drawing is a convenient and forcible means of thought expression.

No drawings will be required of "extras" or such objects as are to be made by those pupils who are in advance of the class. Blue prints will be furnished for this class of work.

In the case of *all* regular or class-work the teacher is required to demonstrate, before the assembled class, the methods to be pursued in constructing the object under consideration.

The successive steps in the execution of the exercise are to be indicated and demonstrated. This includes all operations necessary to the production of the finished article, the use of the various tools, the testing and marking of completed faces. Difficult points in the exercise should be anticipated by the teacher, who will emphasize the means to be taken to avoid or overcome them, and cautions previously given regarding the holding and using of edge tools should be repeated.

Individual demonstration is to be given upon anything but the pupil's work, which is to be entirely the product of his own skill.

Hasty and careless work should be early detected and cor-

rected. This being possible if it is required that each of the steps in the exercise be executed and submitted for inspection before further work is undertaken.

Ornamentation in the form of back-ground punching and chip-carving, is introduced to develop artistic feeling and cultivate the inventive faculty.

Therefore, in giving this work avoid as much as possible the copying of designs shown in this pamphlet. These are intended merely as suggestions. Stimulate the pupils to plan their own designs, which when properly criticised and corrected by the teacher, will in most cases prove effective.

As a means of awakening dormant faculties in children we have found nothing better than to allow them to plan some form of ornamentation and execute it as an "extra."

Work which is not a pupil's best effort should never be decorated. Neither should ornamentation be used to hide defective workmanship.

Sand paper should be used only to clean the work. It is never to be considered as a cutting tool, nor used to remove irregularities in tool work.

Putty is to be used *only* to cover the heads of nails or screws which are set or countersunk.

The steel scrapers are for use on hollows and rounds. They may be classed as cutting tools.

ACCIDENTS.

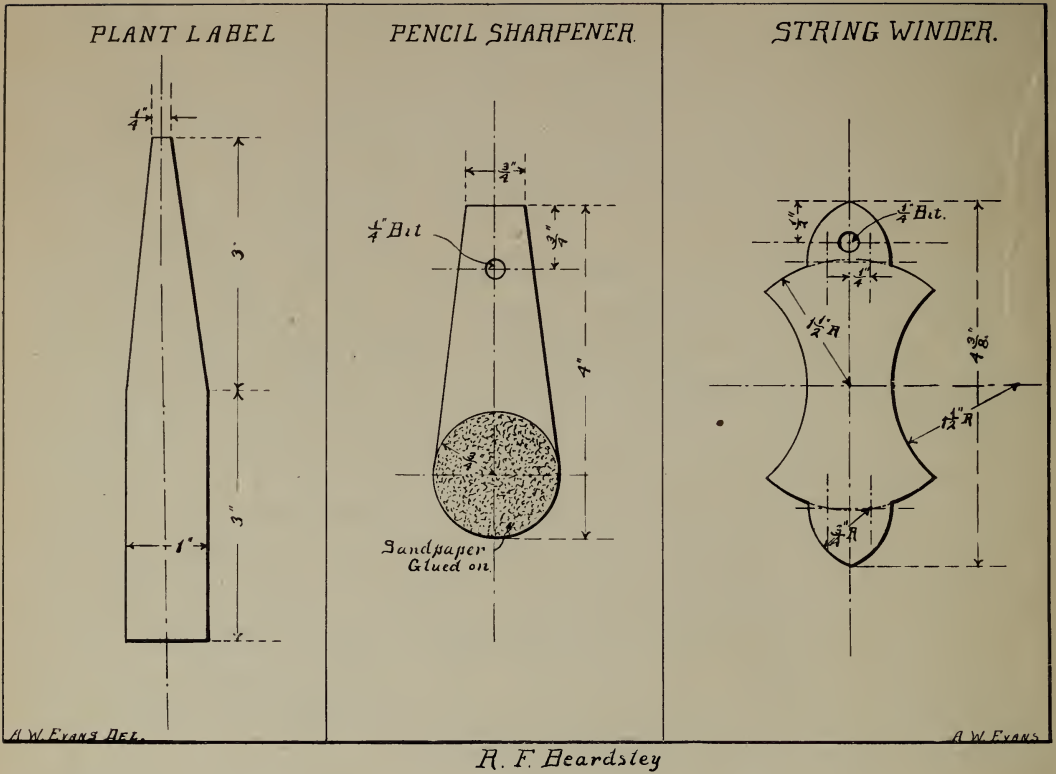
"Slight wounds are liable to occur in the course of the manual training work, and should be managed in accordance with the methods of modern aseptic surgery, not only for the immediate benefit of the one injured but for the educational value derived from extending a knowledge of such methods. Teachers are therefore urged to follow accurately the following instructions which so far as they go may be considered to represent the methods followed by the advanced surgery of the day."

"First all foreign material or dirt must be kept out of

wounds. By the word dirt is meant anything capable of bearing such micro-organisms as produce pus or blood poisoning. Such organisms are constantly present in the air, and upon all substances exposed to the air, such as handkerchiefs, tools, the skin, etc., also in water, except that which has been purified by recent boiling. The individual who takes charge of a wound, should first carefully wash his hands, then wash the wound with recently boiled water, or with water which has been purified by passing through a germ-proof filter such as the Pasteur. In washing a wound never wash anything into it, but always away from it. Then without touching the fingers to the wound cover it with some of the purified (sterilized) gauze found among the supplies. The gauze should be thickly massed over the wound, care being taken to avoid having that portion of it which immediately covers the wound, come in contact with the fingers, clothing, table, or anything else which has been exposed to the air. The gauze should then be fastened down over the wound by a bandage, or where convenient by a piece of adhesive plaster."

"In removing the gauze from the jar, cut off what is wanted with a pair of clean scissors, and immediately close the jar, exposing the contents to the air as little as possible."

"When the bleeding is slight it serves to cleanse the wound partially and is not dangerous. The pressure from the bandage which should never be excessive, will in the great majority of cases be found to be sufficient to control the bleeding. Cobwebs and other infected material should never be used to stop bleeding. When bleeding is excessive it can be controlled by tying a bandage around the limb involved, at some place where the tissues are soft, and tightening it if necessary by twisting it with a ruler."



DIRECTIONS.

PLANT LABEL.

Prepare Stock $\frac{1}{8}$ " or $\frac{3}{16}$ " x $1\frac{1}{4}$ " x 7", s. 2 s., Bass.

1. One edge is to be made straight and smooth by the teacher.

2. Pupils will square one end with knife, (cross-whittling).
To be tested with try square.

3. Measure length and square around with knife.

4. Whittle to knife line and test with try-square.

5. Gauge width and cut to line. (Straight-whittling).

6. Measure and mark small end with pencil and rule.

7. Whittle to oblique lines. (Oblique-whittling).

8. Clean all over with No. 0 sand-paper on a block.

No Drawing.

PENCIL SHARPENER.

Stock, $\frac{1}{8}$ " or $\frac{3}{16}$ " x 2" x 5", s. 2 s., Bass, prepared by teacher.

1. One edge to be made straight and smooth by teacher.
2. Square one end. (Cross-whittling.)
3. Measure length and square that end.
4. Gauge width and cut to line. (Straight-whittling).
5. Mark curve with drawing compass.
6. Cut to curve with knife. (Curve-whittling.)
7. Measure and mark small end with pencil and rule.
8. Cut to oblique lines. (Oblique-whittling.)
9. Locate and bore hole.
10. Give pupil a small piece of No. 0 sand-paper from which he will cut the disk to be glued on. (Clean all over with No. 0 sand-paper on block before gluing).
11. Use wooden hand-screw and a piece of waste wood in gluing on sand-paper.

No Drawing.

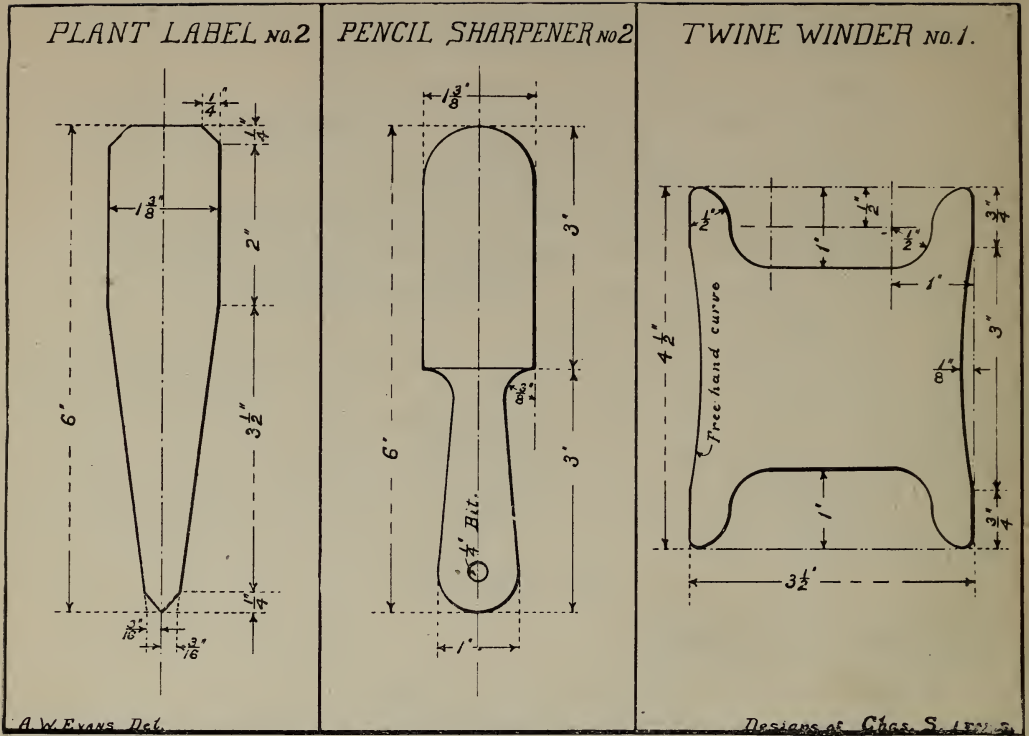
STRING WINDER.

Stock, $\frac{1}{8}$ " or $\frac{3}{16}$ " x $4\frac{1}{2}$ " x 5" s. 2 s, Bass.

1. Draw a pencil line through centre of board in direction of grain.
2. Draw line at right angles to above at its center.
3. Measure and mark curves.
4. Saw nearly to lines with coping-saw.
5. Finish with half-round file and sand-paper.

No Drawing.

NOTE.—The use of the marking gauge is intended here for 7th and 8th Grade pupils. It has been found best to reserve the gauge for later work with pupils of grades below the seventh.



R. F. Beardsley.

DIRECTIONS.

PLANT LABEL No. 2.

Stock, $\frac{1}{8}$ " or $\frac{3}{16}$ " Bass.

Same directions as for Plant Label No. 1.

PENCIL SHARPENER No. 2.

Stock $\frac{1}{8}$ " or $\frac{3}{16}$ " Bass.

Same directions as for Pencil Sharpener No. 1.

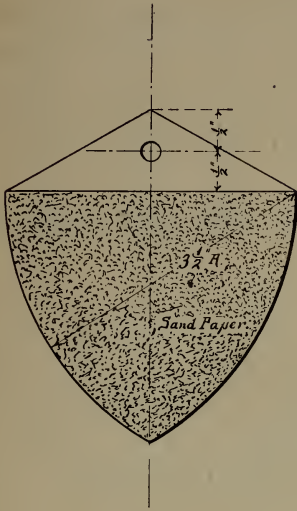
TWINE WINDER No. 1.

Stock $\frac{1}{8}$ " or $\frac{3}{16}$ " Bass.

A whittling exercise.

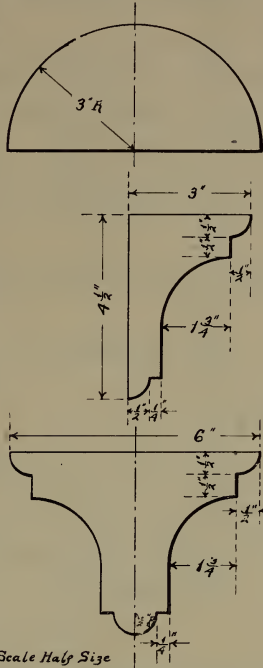
Stock to be prepared the same as for Plant Label No. 1.

No. Drawings.

MATCH SCRATCHER.

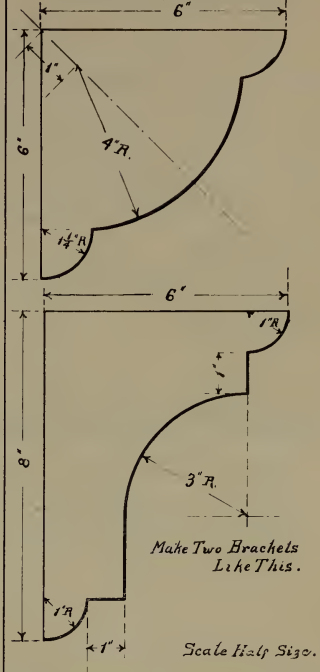
Scale Full Size

A. W. Evans Del.

BRACKET SHELF.

Scale Half Size

A. W. Evans

CORNER BRACKET

Scale Half Size.

R. F. Beardsley.

DIRECTIONS.

MATCH SCRATCHERS.

Stock, $\frac{1}{8}$ " or $\frac{3}{16}$ " x 4" x 5", s. 2 s., Bass.

1. Draw centre line and lay off curves and diagonal top lines.
2. Cut to curves and straight lines with knife.
3. Glue on a square piece of No. 0 sand-paper.
4. Cut to curve when dry.
5. Bore hole.
6. Finish with sand-paper Size on block.

No Drawing.

BRACKET SHELF.

Stock for Top, $\frac{3}{16}$ " x $6\frac{1}{2}$ " x $3\frac{1}{2}$ ", s. 2 s, Bass.

Stock for Brace, $\frac{3}{16}$ " x $3\frac{1}{2}$ " x 5" s. 2 s, Bass.

Stock for Back, $\frac{3}{16}$ " x $6\frac{1}{2}$ " x 5" s. 2 s. Bass.

Make each part a separate exercise.

Use pencil, rule, compass, coping-saw and half-round file.

When the three parts are correctly finished and *cleaned* with sand-paper, fasten back and brace together by means of glue and brads, having pupils locate and start the brads before applying the glue. Give particular directions to apply glue very sparingly and have all superfluous glue cleaned off before it hardens.

Locate and start brads in top and fasten with glue to back and brace.

No Drawing.

CORNER BRACKET.

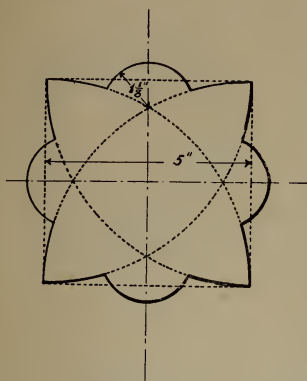
Stock for Top, $\frac{3}{16}$ " x 7" x 7" s. 2 s. Bass.

Stock for Braces, $\frac{3}{16}$ " x 7" x 9" s. 2 s. Bass.

Same steps, tools and directions as for *Bracket Shelf*.

No Drawing.

MAT, No 2.



Scale Half Size

A.W. EVANS, Ill. Designer A.W. EVANS

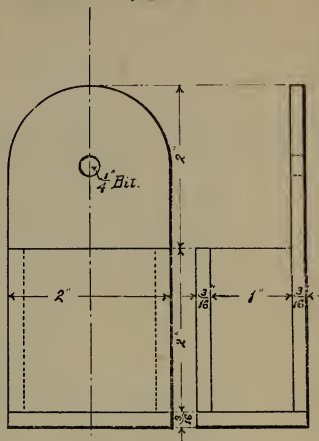
ENVELOPE OPENER.



Scale Full Size.

Designer A.W. EVANS
R. F. BOAS, Ill.

MATCH SAFE. *4



Scale Full Size.

DIRECTIONS.

MAT No. 2.

Stock, $\frac{1}{8}$ " or $\frac{3}{16}$ " x $6\frac{1}{2}$ " x $6\frac{1}{2}$ ", s. 2 s., Bass.

1. Plane edge and end square, using shooting-board.
2. Mark five inch square, with knife-lines.
3. Lay off curves, and saw with coping-saw.
4. Finish to lines with knife.
5. Design a background for punching.
6. Lay off design, cut lines with knife, and clean before punching.

No Drawing.

ENVELOPE OPENER No. 1.

Stock, $\frac{3}{16}$ " x $1\frac{1}{4}$ " x $7\frac{1}{2}$ ", s. 2 s., Bass.

1. Draw centre line and lay off curves at each end with pencil and compass.
2. Mark design for chip-carving as shown.

3. Whittle to lines and form the blade with knife.
4. Carve handle.
5. Sand-paper to clean.

No Drawing.

MATCH SAFE No. 4.

Stock, $\frac{3}{16}$ " x $2\frac{1}{2}$ " x 12" s. 2 s., Bass.

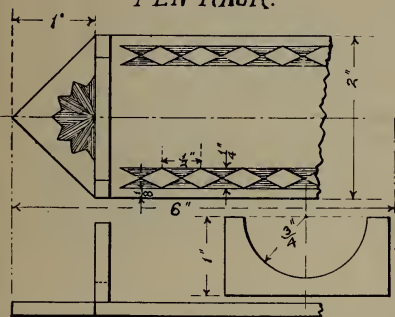
1. Plane edge and one end and plane to width.
2. Saw off $4\frac{1}{4}$ " for back. (Back-saw and bench-hook.)
3. Make back. (Whittle curve.)
4. Make front and sides and fit together.
5. Make and fit base.
6. The best match safes may have a star carved in the front panel. Sand-paper for striking may be glued to sides.

General Drawing.

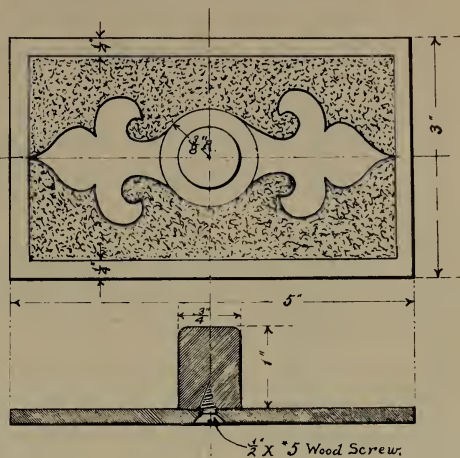
ROUND MAT.



PEN RACK.



BLOTTER.



A. W. Evans Del.
R. F. Beardsley.

DIRECTIONS.

ROUND MAT.

Stock, $\frac{1}{4}$ " x $6\frac{1}{2}$ " x $6\frac{1}{2}$ ", s. 2 s., Whitewood.

1. Find centre of board by drawing the diagonals of square.
2. Mark curves with compass and construct star, using 2" radius to locate the points.
3. Saw, with *small turning-saw*, nearly to outer curve and finish with flat file (draw filing).
4. Cut on inner curve and on lines of star with knife, and punch background. (Particular attention should be given to even punching and to correct handling of the hammer.)
5. Clean with No. 0 sand-paper.

No Drawing.

BLOTTER.

Stock, $\frac{3}{16}$ " x $3\frac{1}{2}$ " x $5\frac{1}{2}$ ", s. 2 s., Bass, and 1" length of $\frac{3}{4}$ " Dowel-rod.

1. Plane one edge and one end, testing with try-square.
2. Gauge and plane width.
3. Measure and mark length with *knife* and plane to knife line.
4. Mark border line with gauge and knife.
5. Draw design with pencil and follow with knife. Punch background.
6. Round and smooth the end of the handle with knife. Drill and countersink hole and screw together. (A blotter is to be glued to the base.)

NOTE.—The smoothing plane is to be used in this exercise. Pupils are to be taught to take apart and put together and to whet the plane blades. The grinding will be done by the teacher. The design shown for ornamentation is suggestive, as are nearly all those show hereafter. Teachers will vary designs as seems best and where possible make use of the ideas of the children. Paper templates may be used for duplication in ornamental designs.

No Drawing.

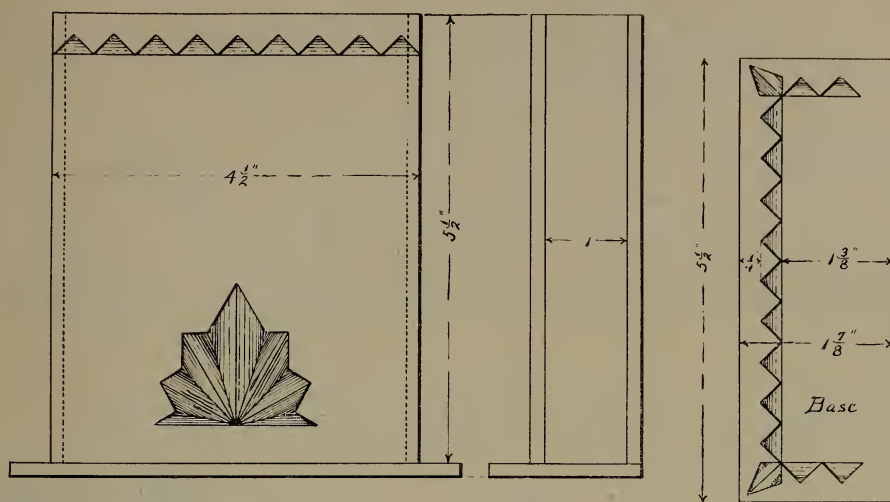
PEN RACK.

Stock, $\frac{3}{16}$ " x $2\frac{1}{2}$ " x 10", s. 2 s., Bass.

1. Plane edges parallel and to required width.
2. Saw off a piece $6\frac{1}{4}$ " long and gauge centre line.
3. Point ends with knife; lay off design and carve.
4. Mark a circle on the extra piece and plane ends to proper distance from curve and square with edges.
5. Drill a small hole near edge of the circle, insert blade of coping-saw, and cut to line. Finish with half-round file, and saw apart with back-saw.
6. Clean and fasten together with glue and brads.

No Drawing.

ENVELOPE CASE.



Scale Full Size.

A. W. Evans Del.

R. F. Beardsley.

DIRECTIONS.

ENVELOPE CASE.

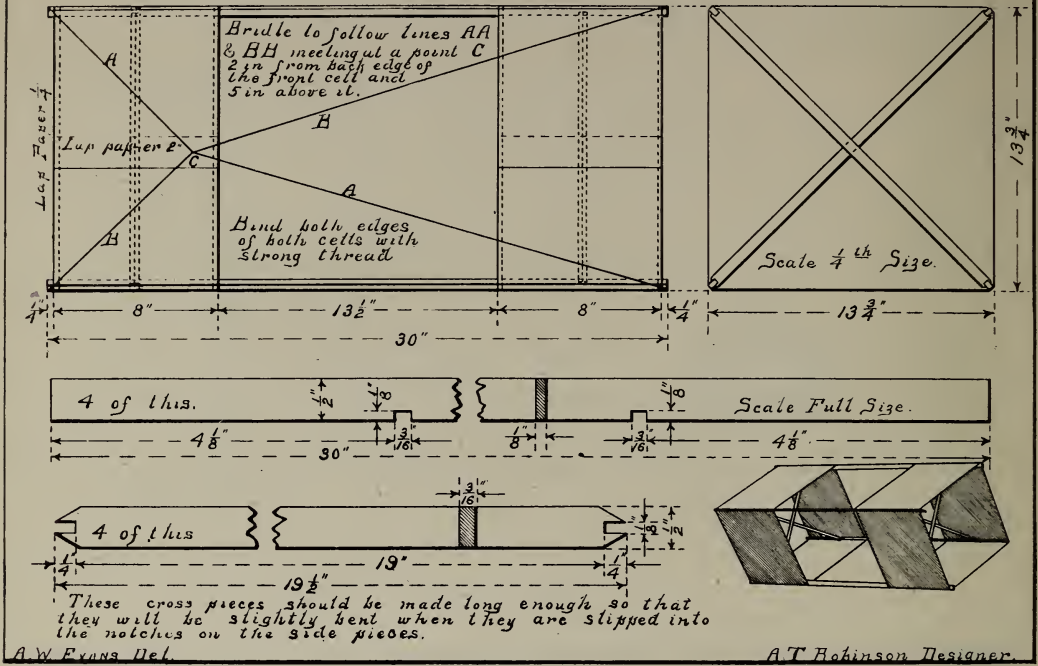
Stock, $\frac{3}{16}"$ Basswood.

An exercise in the use of the smoothing-plane on edges and ends. Also an exercise in chip-carving.

1. Plane pieces to size, using the shooting-board.
2. Carve the base as shown.
3. Clean and fasten together with glue and brads, locating the brads by means of a very light gauge line, $\frac{3}{32}"$ from edge, and measuring the distances apart.
4. Carve coping at top and ornament as shown.
5. A design may be carved on sides if desired.
6. Finish with sand-paper and shellac.

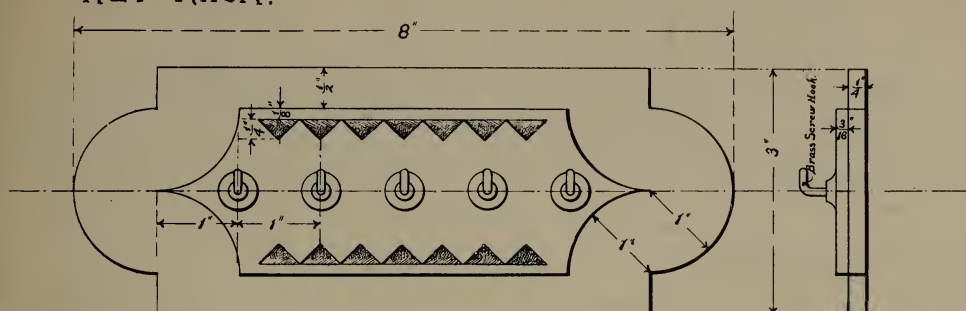
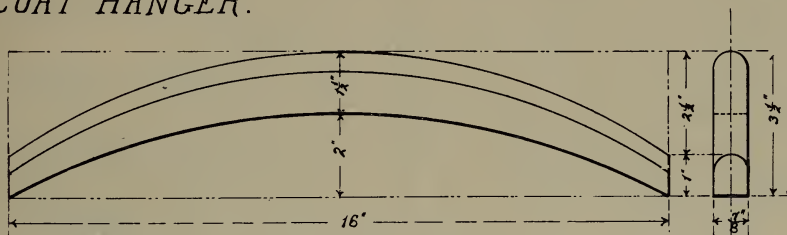
Drawing as shown.

BOX KITE.



H. F. Beardsley

Twine for making the kite and bridle, as shown, will be furnished. No twine for flying the kite is to be supplied.
No Drawing.

KEY RACK.*COAT HANGER.*

A. W. EVANS, UEL.

R. F. BEARDSLEY.

DIRECTIONS.

KEY RACK.

Stock, $\frac{1}{4}$ " x $3\frac{1}{2}$ " x $8\frac{1}{2}$ " Whitewood, and $\frac{3}{16}$ " x $2\frac{1}{2}$ " x $6\frac{1}{2}$ " Cherry.

1. Plane one edge, gauge width and centre line (whitewood).
2. Plane to width.
3. Mark curves at ends and square the shoulders with knife lines on both face and edge.
4. Saw curves with turning-saw and saw shoulders with back-saw.
5. Pare vertically with chisel, taking light cuts to lines. Test with try-square.
6. Finish with file, but do not allow a file to be used unless the work has been well done with a sharp chisel.
7. Clean the face with smoothing-plane.
8. Make front plate using turning-saw and file for curves.
9. Carve as shown.

10. Glue in place and locate position of hooks.
11. Clean and finish with shellac.
12. Screw the hooks in place.

NOTE.—Particular care should be used in gluing that the superfluous glue, which is pressed out from between the pieces, is at once removed, and that the clamps are so adjusted as not to mar the work.

No Drawing.

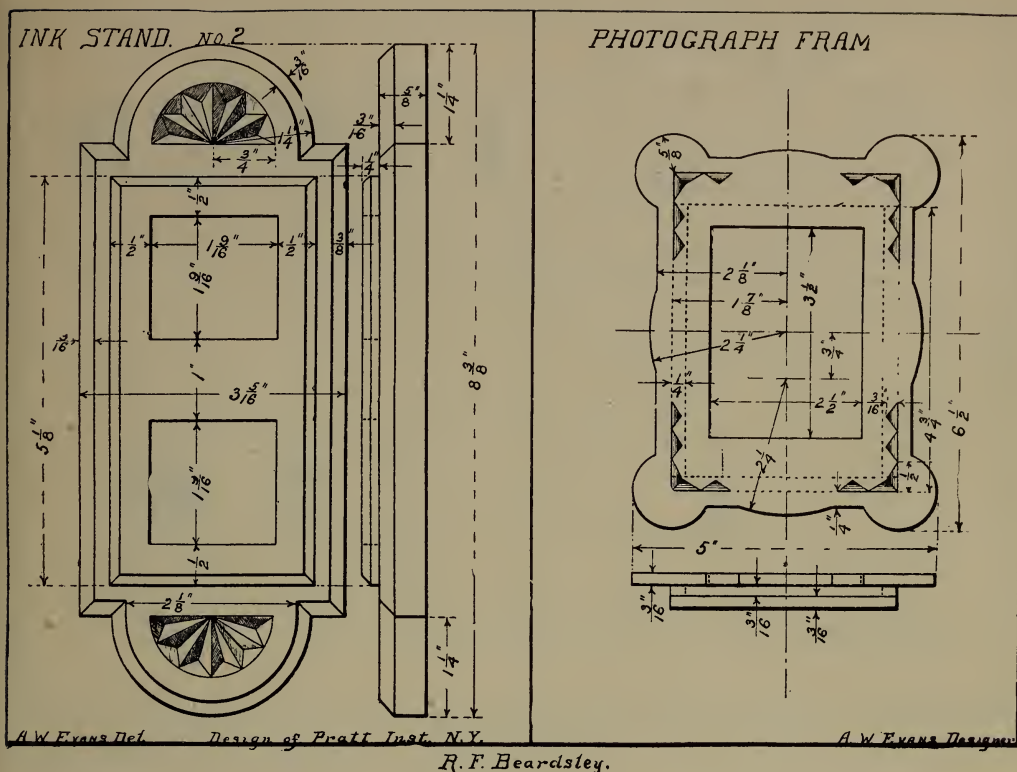
COAT HANGER.

Stock, 1"x4"x16½" rough Pine.

1. Plane all over to 7/8"x3½"x16".
2. Mark curves on ends with compass.
3. Mark curves on sides free-hand or with template which may be made of thin basswood.
4. Saw nearly to curves with turning-saw and finish with spokeshave.
5. Finish with sand-paper, but do not use a file.
6. Fit with large screw hook to serve as a hanger.
7. Shellac.

NOTE. This is principally an exercise in modeling with the spokeshave, therefore all irregularities which can be felt with the hand, are to be removed with that tool. Sand-paper is to be used *only* for cleaning.

No Drawing.



DIRECTIONS.

INK STAND No. 2.

Stock, $\frac{5}{8}$ " Whitewood or $\frac{1}{2}$ " Gum and $\frac{1}{4}$ " Maple or $\frac{3}{16}$ " Cherry.

An exercise in the use of the chisel and plane and in chip-carving. The thin top piece may be built up from strips of various colors.

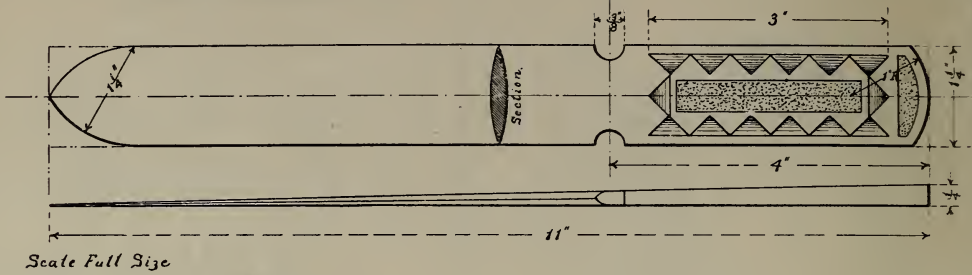
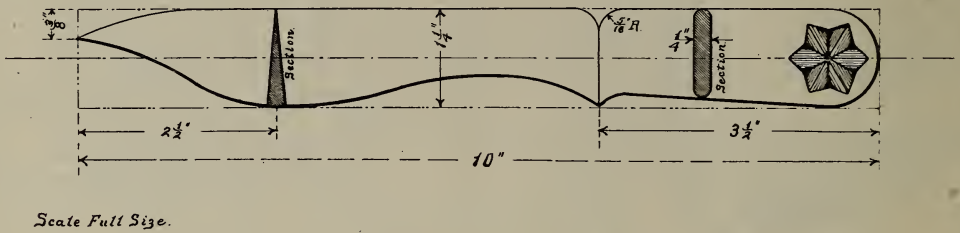
No Drawing.

PHOTOGRAPH FRAME.

Stock, $\frac{3}{16}$ " Bass or Cherry.

Use compass, rule, knife and file.

No Drawing.

PAPER KNIFE "1*PAPER KNIFE "2.*

A. W. Evans Des.

R. F. Beardsley.

DIRECTIONS.

PAPER KNIFE No. 1.

Stock, $\frac{1}{4}$ " x $1\frac{3}{8}$ " x $11\frac{1}{2}$ ", s. 2 s., Cherry.

1. Plane to required width.
2. Draw centre line lightly with pencil.
3. Lay off curves at ends and at juncture of handle and blade.
4. Cut outline with coping-saw and smooth with file.
5. Form blade with knife, spokeshave and file, working to a center line on the edge.
6. Mark design in handle and carve.
7. Clean thoroughly and finish with three very thin coats of shellac.

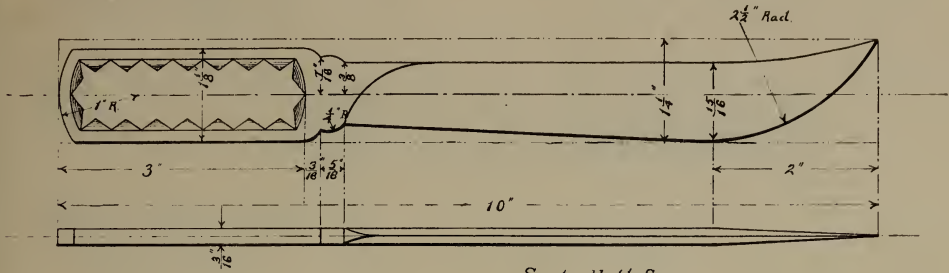
PAPER KNIFE No. 2.

Stock, same as above.

Directions same as for Paper Knife No. 1.

No Drawings.

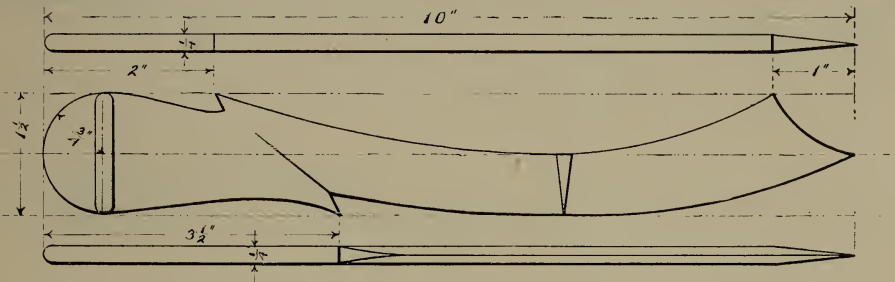
PAPER KNIFE *3



Scale Full Size.

PAPER KNIFE *4.

A.W. Evans



Scale Full Size.

A.W. Evans Del.

R F Beardsley

DIRECTIONS.

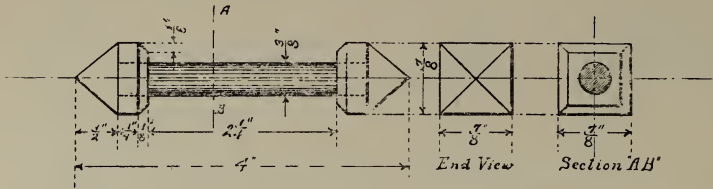
PAPER KNIVES No. 3 AND No. 4.

Stock $\frac{1}{4}$ " Oak, Maple or Cherry.

Proceed in same manner as for Paper Knives No. 1 and 2.

No Drawing.

KNIFE AND FORK REST.



10. Sand-paper cylindrical part.
11. Finish with shellac.

NOTE.—This exercise may be made from any close grained hard wood. The cross bar may be made from a wood contrasting in color with that of the ends.

General Drawing without shading.

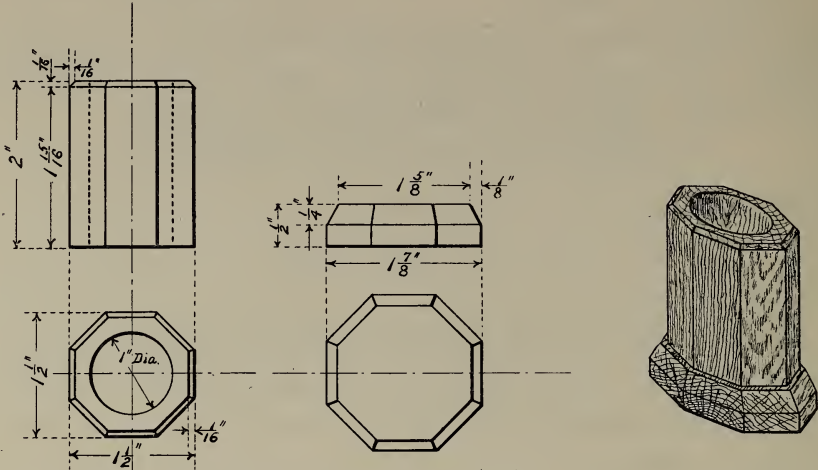
PEN HOLDER.

Stock, $\frac{1}{2}$ " x $\frac{3}{4}$ " x 9" s. 2 s. Red Cedar.

1. Plane stock to $\frac{1}{2}$ " x $\frac{1}{2}$ ".
2. Mark circles at ends and bore hole for peg.
3. Cut off $1\frac{1}{2}$ " and form peg to tightly fit hole except at outer end where it should be slightly smaller to admit pen.
4. Glue in peg.
5. Whittle to shape.

No Drawing.

MATCH BOX No. 3.



The hole 1" in diameter to be bored through the block while in the rough, block then to be finished using hole as a basis to measure from.

A. W. Evans Dsg.

Wm. P. Hawley Designer

R. F. Beardsley.

DIRECTIONS.

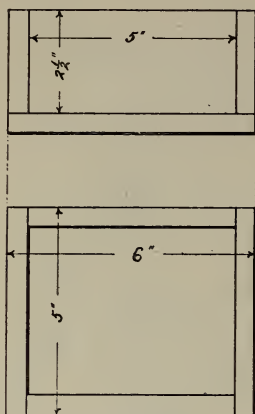
MATCH BOX No. 3.

Stock, (several pieces of either hard or soft wood may be used, built up either vertically, horizontally or radially).

The teacher will give such directions as are necessary to perform the work in accordance with the number and shape of pieces used.

Detail Drawing.

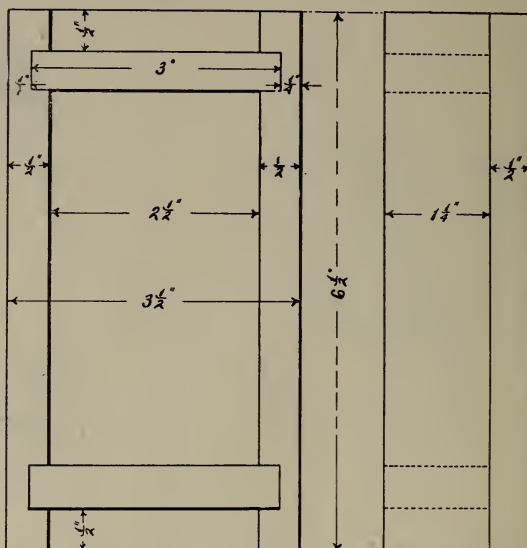
NAIL BOX *1



Scale Half Size

A W Evans. Del.

NAIL BOX *2.



Scale Full Size.

R F Beardsley.

DIRECTIONS.

NAIL BOX No. 1.

Stock, $\frac{1}{2}$ ", s. 2 s., Pine.

1. Plane one piece to the required width for the four sides.
2. Plane one end on shooting-board.
3. Measure length for one side piece and square all around with knife.
4. Saw off with back-saw and plane the end to knife-lines on shooting-board.
5. Proceed as above for each side.
6. Measure and mark for brads as directed in Envelope Case.
7. Nail and Glue together.
8. Plane and fit bottom.
9. Clean all over and shellac

NOTE.—Teach use of nail-set.

Have inner surface cleaned before fitting together.
General Drawing as shown.

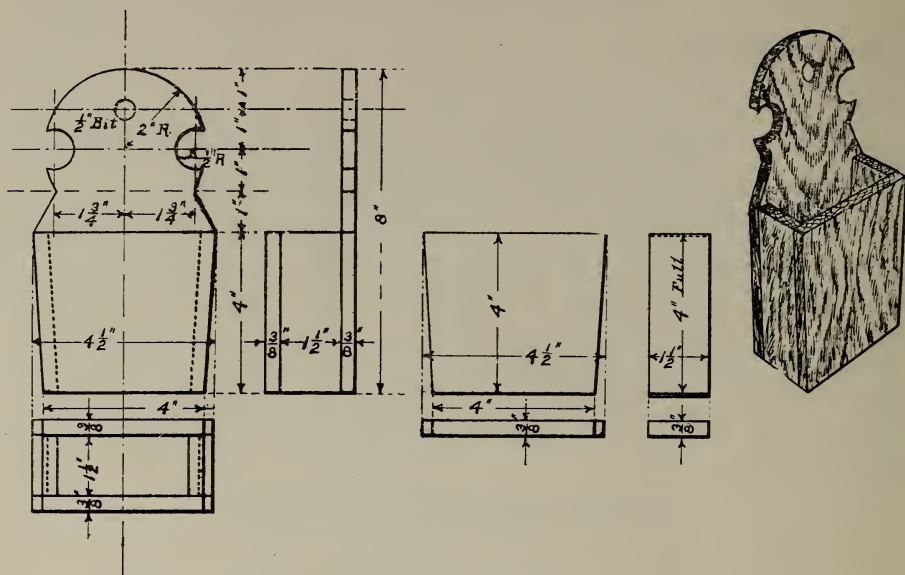
NAIL BOX No. 2.

Stock, $\frac{1}{2}$ " s. 2 s., Pine.

1. Plane sides and ends to size, as for Nail Box No. 1.
2. Mark out gains with knife lines and gauge.
3. Saw with back-saw exactly to knife lines so that no chisling will be required on sides of gains.
4. Chisel gains with $\frac{3}{8}$ chisel.
5. Fit and glue together, after cleaning inner surfaces.
6. Prepare bottom and nail and glue to frame.
7. Clean with the smoothing-plane and sand-paper.
8. Shellac.

General Drawing as shown.

WHISK BROOM HOLDER. No. 1.



A. W. E. & Sons, Inc.

R. F. Beardsley.

A. E. Gage Designer

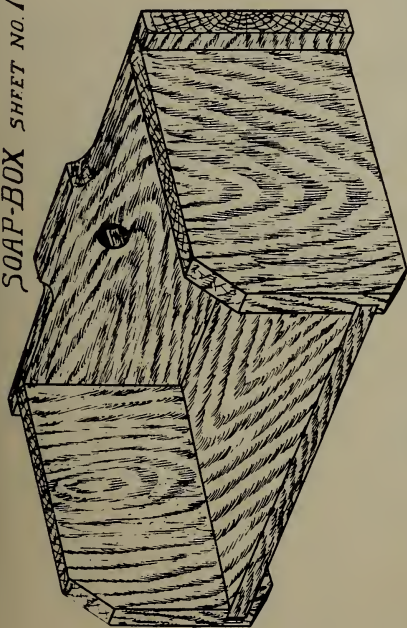
DIRECTIONS.

WHISK BROOM HOLDER, No. 1.

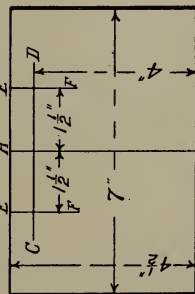
Stock, $\frac{3}{8}$ " Whitewood.

General directions for planing dressed lumber.

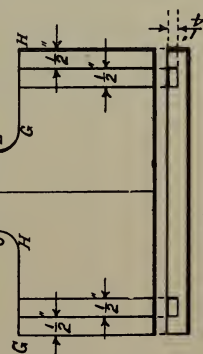
General Drawing.



Directions.
Plane a piece of $\frac{1}{2}$ " stock to the size shown. Lay off the center line "AB" the gauge line "CD", and the lines "EF".



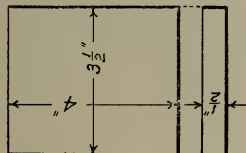
Trim to the lines "GH" and "CD" with a chisel. Lay off the gains as shown.



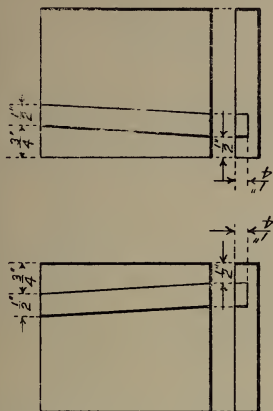
A. W. Evans Del.

R. F. Beardsley.

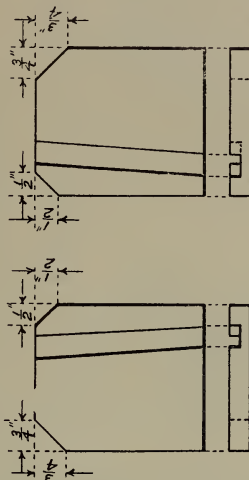
Plane two $\frac{1}{2}$ " pieces to size shown below.



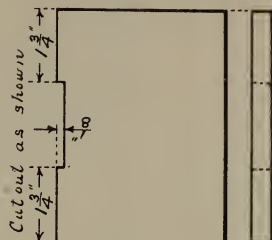
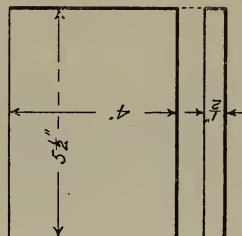
Lay off the gains as shown.



Cut out the gains. Mark and cut the corners to dimensions shown.



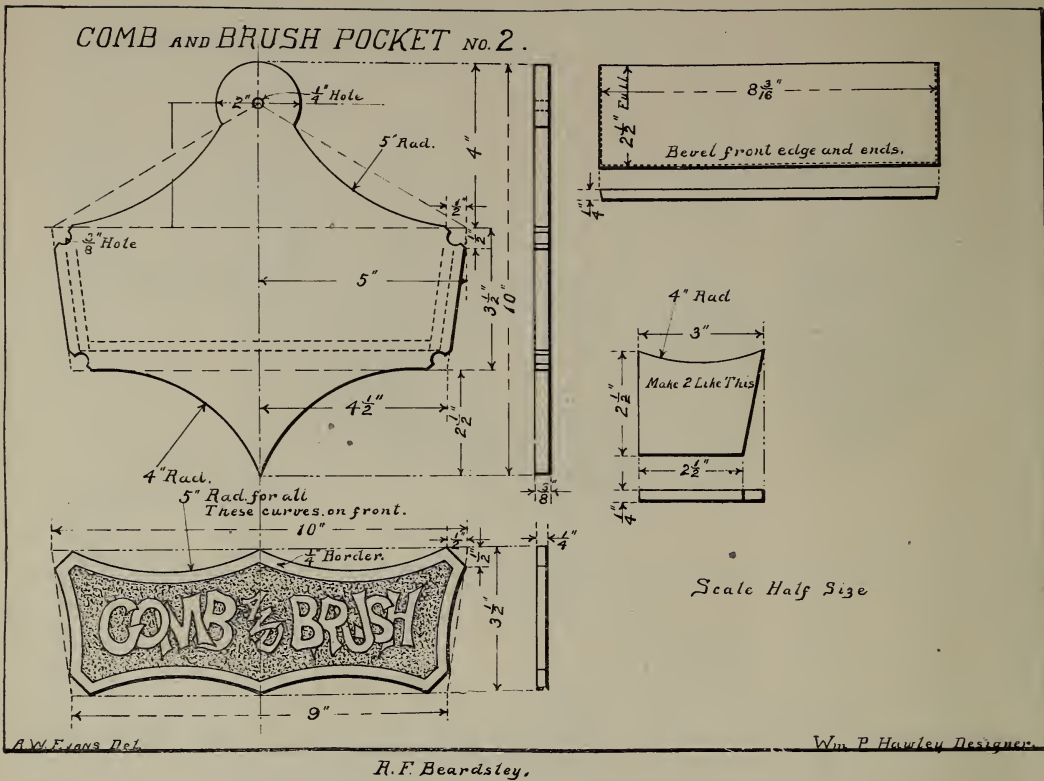
Plane a piece to size shown.



A. W. Evans Del.

R. F. Beardsley.

J. A. Toomey Des.



DIRECTIONS.

COMB AND BRUSH POCKET No. 2.

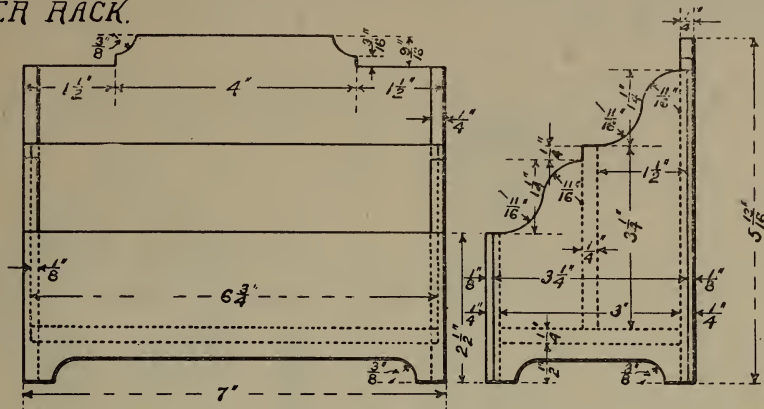
Stock, $\frac{3}{8}$ " and $\frac{1}{4}$ " Whitewood.

An exercise in the use of the spokeshave and bevel, also ornamentation by means of letters.

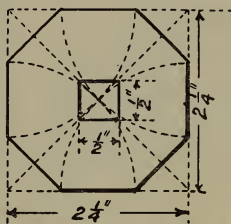
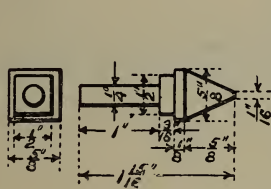
1. Make back piece first, then front and sides.
2. Set bevel to angle of side pieces and use in planing bevel of bottom piece.
3. Fasten together with brads and glue.
4. Shellac, 2 coats.

Detail Drawing.

LETTER RACK.



TOP.



A. W. Evans Del.

H. F. Beardsley.

Designs of Pratt Inst. N.Y.

DIRECTIONS.

LETTER RACK.

Stock, $\frac{1}{4}$ " Hardwood.

Construct rack according to drawing and either carve or punch a design on sides and front.

This model should be highly polished after applying at least five coats of shellac.

Drawing as shown.

TOP.

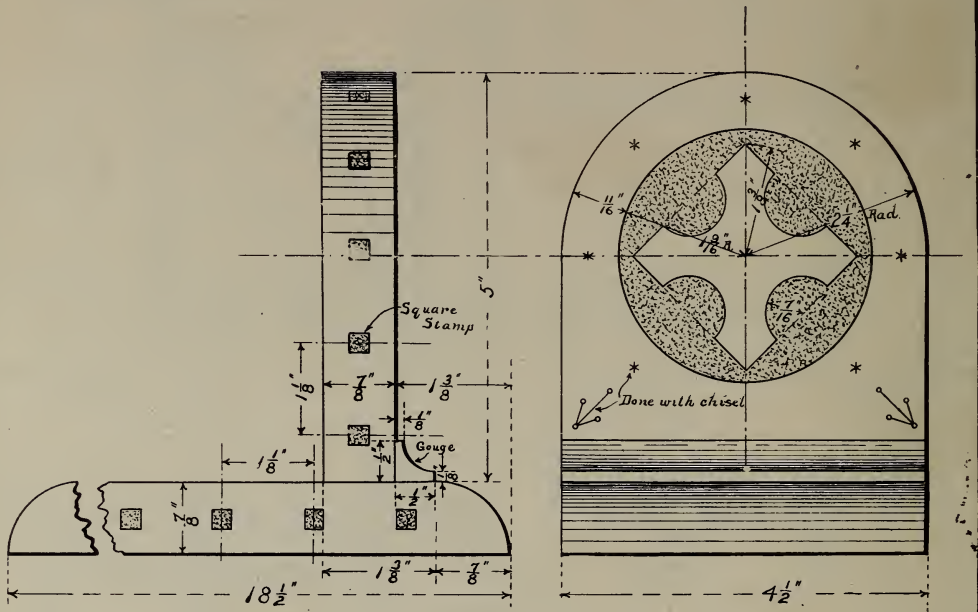
Stock, $\frac{3}{16}$ " Basswood.

Stock, $\frac{5}{8}$ " Hardwood.

Make this entirely an exercise in chiseling.

Drawing as shown.

BOOK RACK No. 1



A. H. Evans Del.

Geo. Robbins Designer.

R. F. Beardsley.

DIRECTIONS.

BOOK RACK No. 1

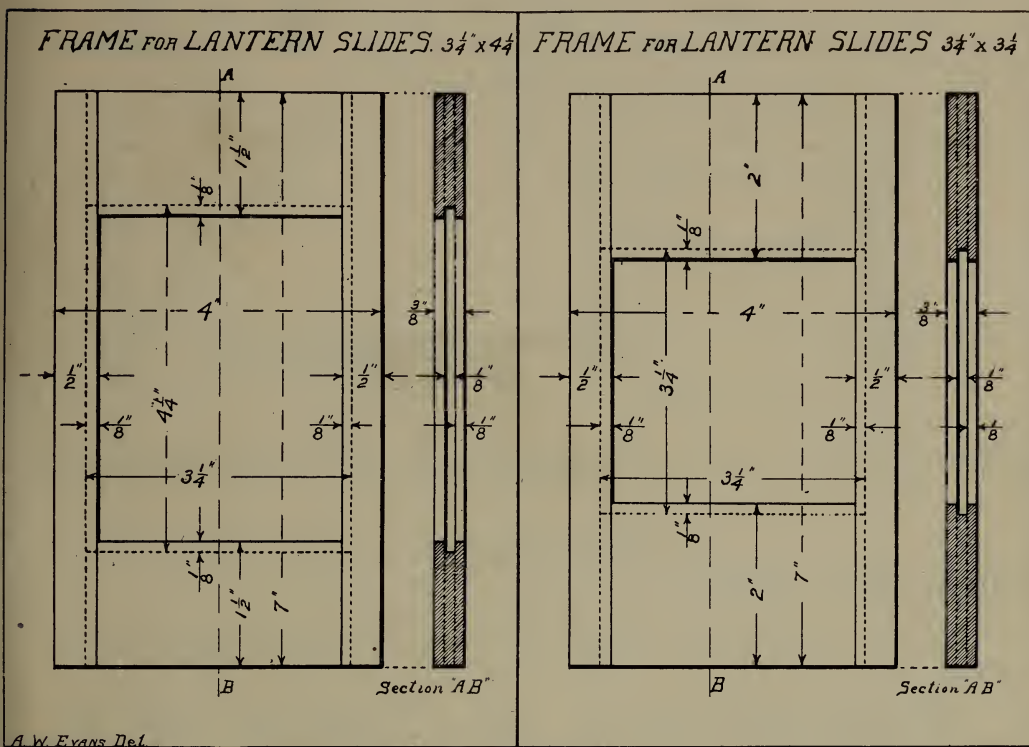
Stock, $\frac{7}{8}"$ x $5\frac{1}{2}"$ x $30"$ s. 2 s., Pine.

1. Plane to width, saving the long strip from edge for making the moulding.
2. Plane ends square.
3. Gauge centre line and measure from ends $2\frac{3}{4}"$ which will give centre for curves.
4. Mark curves and saw off.
5. Finish curves with chisel and file, (See Note.)
6. Mark design as shown and cut the outline with knife.
7. Shellac and then stamp background and cut stars with $\frac{1}{8}"$ chisel.
8. Make base by planing the curved ends.
9. Stamp edges.

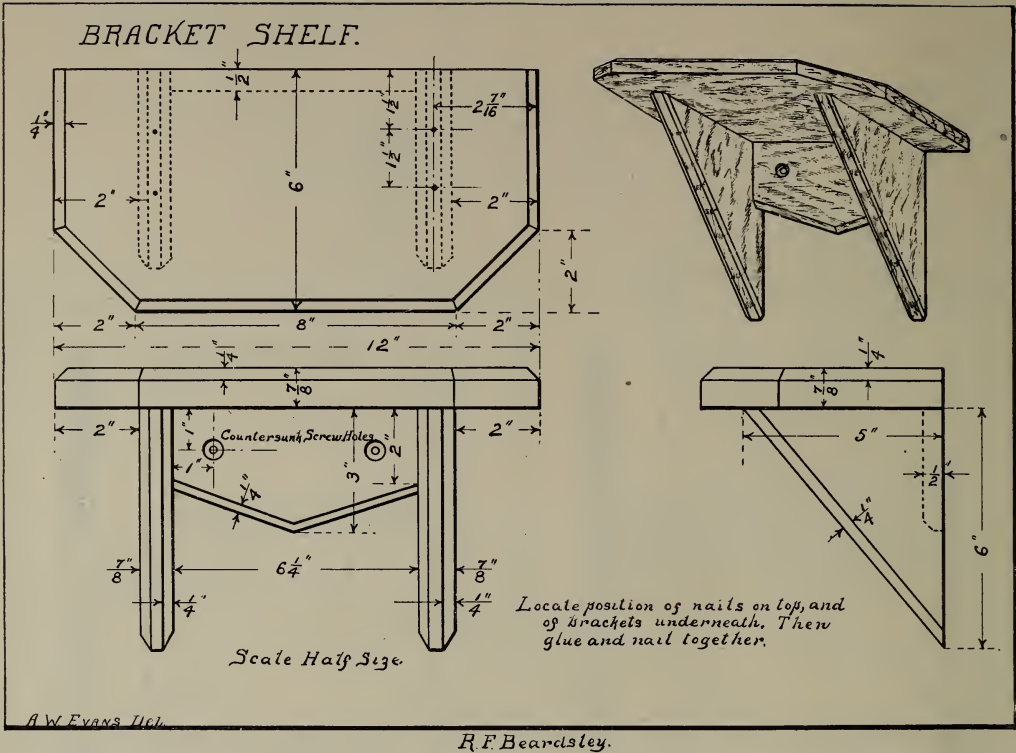
10. Make moulding; glue and nail together and finish with shellac.

NOTE.—The filing should be done in the direction of the curve and not at right angles to the face of board.

Drawing as shown, omitting shading.



These frames should be made of Red Cedar.



DIRECTIONS.

BRACKET SHELF.

Stock, 1" x 7" x 20" rough Pine, and $\frac{1}{2}$ " x $3\frac{1}{2}$ " x $6\frac{1}{2}$ " s. 2 s., Pine.

First have pupils saw off a piece 7" long, then plane and finish the top of shelf according to directions. A set of models such as are shown are a great help in directing this work if it is used as a first planing exercise or if given as an extra. This method of showing processes is not to be carried beyond the first years work.. This shelf may be made with the chamfered edge of the top underneath instead of as in the drawing.

A blue print of the following directions may be placed before the pupil.

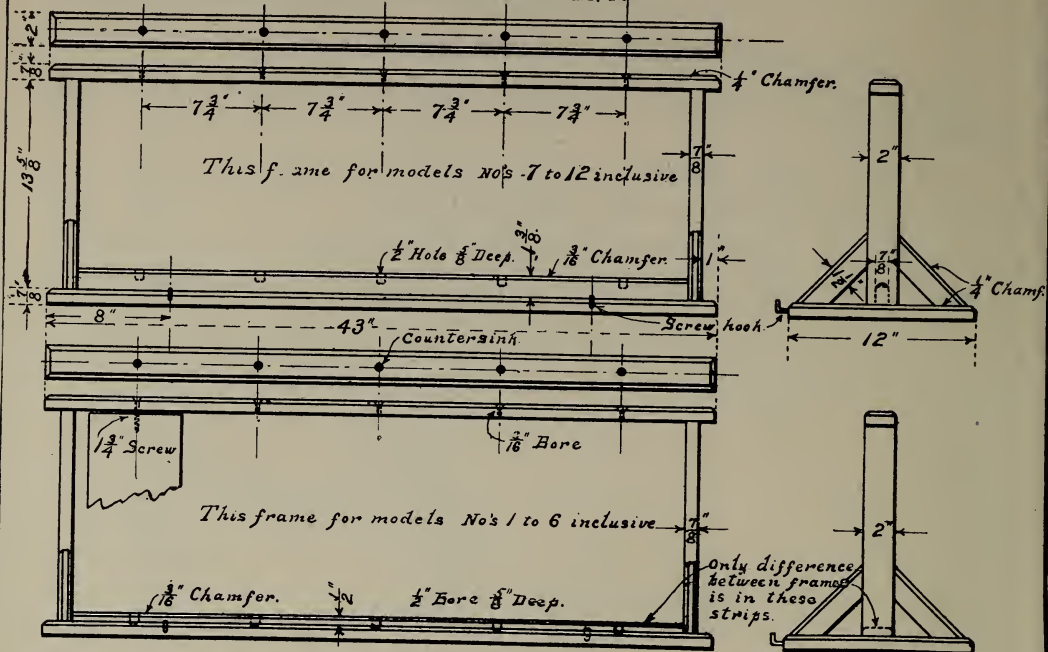
1. Plane the working *face* and mark it X.
2. Plane the working *edge* and mark it II.
3. Chamfer a *corner* [ask teacher which one.]
4. Plane this *end* square with working *face* and working *edge*.

5. Measure the length from this planed *end*.
6. Square across with knife-line.
7. Saw off *end* just beyond the knife-line.
8. Chamfer a corner opposite tried *edge* and plane this *end* to knife-line.

9. Gauge the *width*.
10. Plane the *rough edge* to gauge-line.
11. Gauge the *thickness* on edges and ends.
12. Plane the *rough face* to gauge-lines.

General Drawing.

SHELF MODELS AND FRAME SHEET NO. 1



A.W. Evans Del.

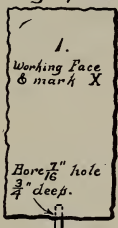
E.W. Hochm Designer.

R.F. Beardsley.

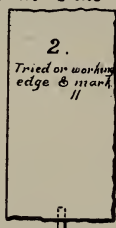
SHELF MODELS AND FRAME SHEET NO. 2

Use rough pieces 13"x7"x1" Pine

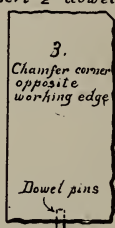
Insert 1/2" dowels 1 1/2" long in bottom of each piece



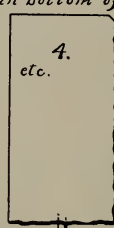
1. Working face and mark X.



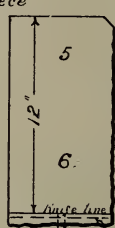
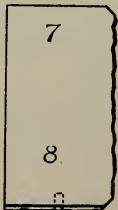
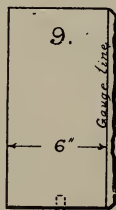
2. Tried or working edge and mark II.



3. Chamfer corner opposite working edge



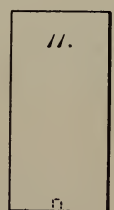
4. Plane end square with face and working edge.

5. Measure length from this plane end
6. Square across with a knife line and saw off on pencil line 1/8" outside of knife line.7. Sawed off 1/8" outside of knife line
8. Chamfer corner opposite working edge and plane to knife line. (Square with face and working edge.)

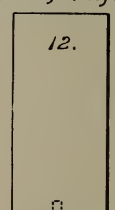
9. Gauge width on face. (From working edge)



10. Plane rough edge to gauge line.



11. Gauge thickness (7/8") on edges and ends.



12. Plane the rough face to gauge lines.

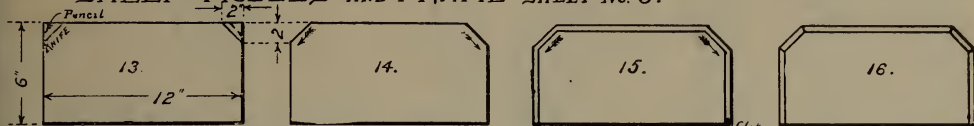
The above directions are to be written with ink upon the models.

A.W. Evans Del.

E.W. Hochm Designer.

R.F. Beardsley.

SHELF MODELS AND FRAME SHEET NO. 3.

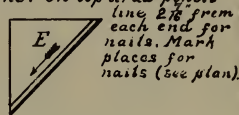
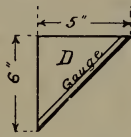
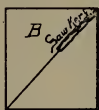
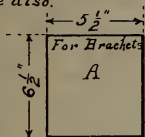


13. Measure 2" each way from two upper corners and connect with knife line. About $\frac{3}{8}$ " outside knife line draw pencil line for sawing. Draw knife line on opposite side also.

14. Saw off corners to pencil line and plane to knife line. (Plane in direction of \rightarrow .)

15. Gauge lightly $\frac{1}{4}$ " around edges and ends for chamfering. Clip off corners with chisel to gauge line. Plane carefully in direction of \rightarrow .

16. (1) Plane chamfered edges & ends. (2) To find places for brackets and nails. On bottom, net, chamfered draw a knife line about half way across the board and $2\frac{1}{2}$ " from each end. On edge draw pencil line. On top draw pencil line $2\frac{1}{8}$ " from each end for nails. Mark places for nails (see plan).

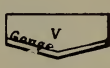
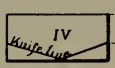
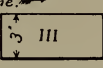
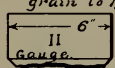
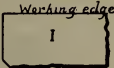
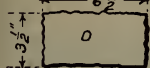


A. For Brackets. Finish piece for brackets same as for shelf No 1 to 12.

B. Draw pencil line from corner to corner, and saw with cross cut saw.

C. Measure from square D. Gauge $\frac{1}{4}$ " on corner 5" across the planed angle grain, 6" with the grain (both edges) for line. Plane with the grain to knife line.

E. Plane chamfers in direction of \rightarrow and complete the bracket.



O. Piece $\frac{1}{2}$ " x $3\frac{1}{2}$ " x $6\frac{1}{2}$ ".

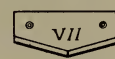
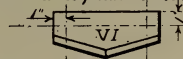
I. Plane working edge, then chamfer opposite corner and block plane end.

II. Measure length or distance between corners. Square rough edge to across with knife line gauge line and plane to it.

III. Gauge the width and plane rough edge to across with knife line gauge line.

IV. Measure 2" from top on each side, and draw knife line to centre on lower edge. (Draw knife lines on both sides)

V. Gauge $\frac{1}{4}$ " on lower edge for chamfering.



VI. Chamfer with plane. Measure 1" from each end + top for holes. countersink each.

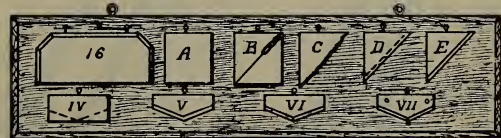
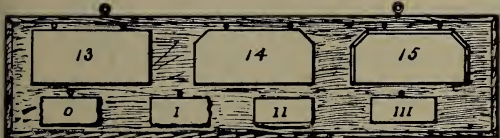
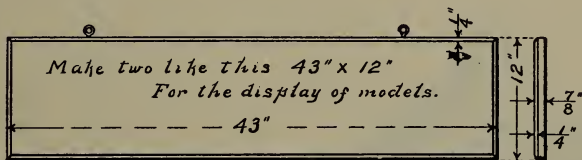
VII. Bore holes thin.

E. W. Hoshin. U.S.A.

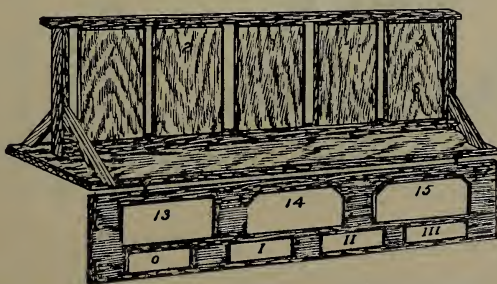
A. W. Evans Del.

R. F. Beardsley

SHELF MODELS AND FRAME SHEET NO. 4.



Arrangement for the display of models on boards. Stain boards with some dark stain



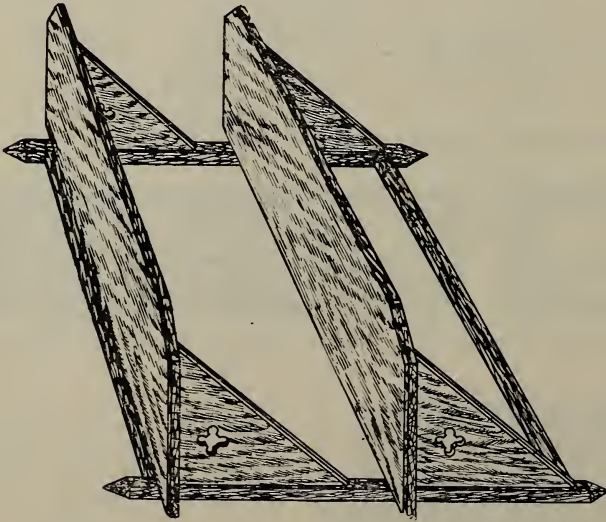
Place the entire arrangement on teachers bench in view of the class, so that pupils may inspect at any time during the lesson.

A. W. Evans Del.

R. F. Beardsley.

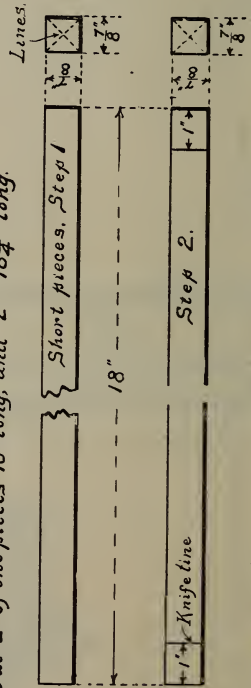
E. W. Hoshin Designer.

HANGING SHELVES SHEET NO. 1.



Directions.

Plane up 4 pieces $\frac{1}{8}$ " Square and 20" long;
Cut 2 of the pieces 18" long, and 2 - $18\frac{1}{4}$ " long.

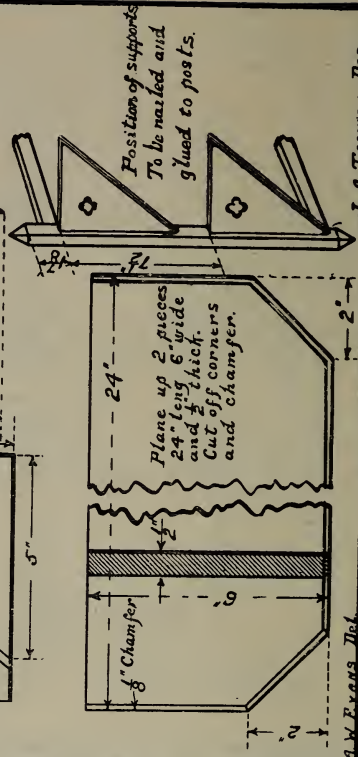
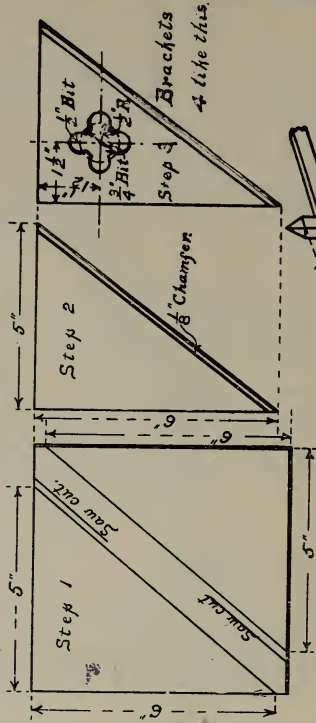
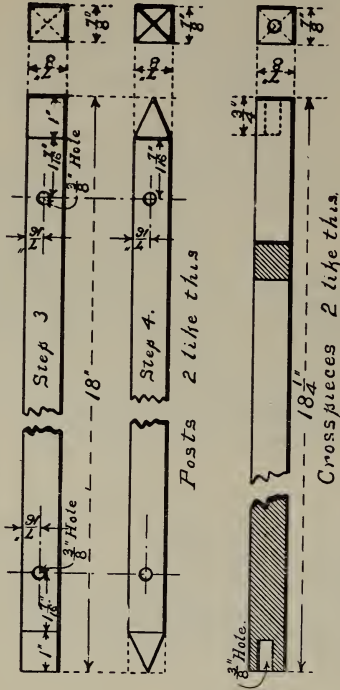


A. W. Evans Del.

R. F. Heardsley.

J. A. Toomey Designer.

HANGING SHELVES. SHEET NO. 2.

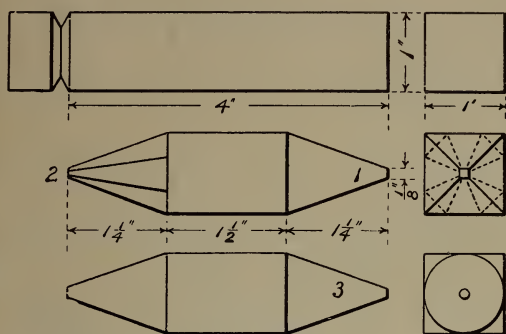


A. W. Evans Del.

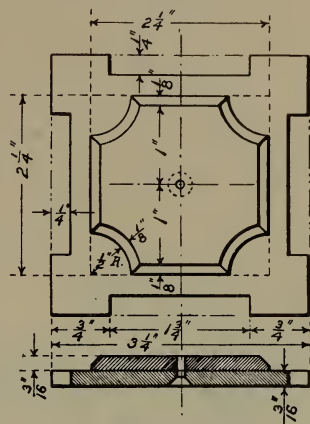
R. F. Heardsley.

J. A. Toomey Des.

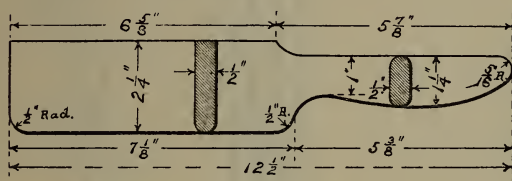
TIPCAT.



PAPER FILE.



TIPCAT BAT



R. W. Evans Del.

R. F. Beardsley.

Designs of Pratt Inst. N.Y.

DIRECTIONS.

TIPCAT.

Stock, $1\frac{1}{4}$ " x $1\frac{1}{4}$ " Gumwood.

A whittling exercise.

1. Plane to 1" square by $4\frac{1}{2}$ " long.
2. Square around and true the ends with the knife as shown.

Three forms are shown, but, which-ever is selected, insist that both ends be alike and accurately made. This being a toy for the boys games, he is likely to hurry and slight his work. This tendency is to be restrained.

No Drawing.

TIPCAT BAT.

Stock, $\frac{1}{2}$ " Pine or Maple.

An exercise in modeling with the spokeshave.

Drawing as shown.

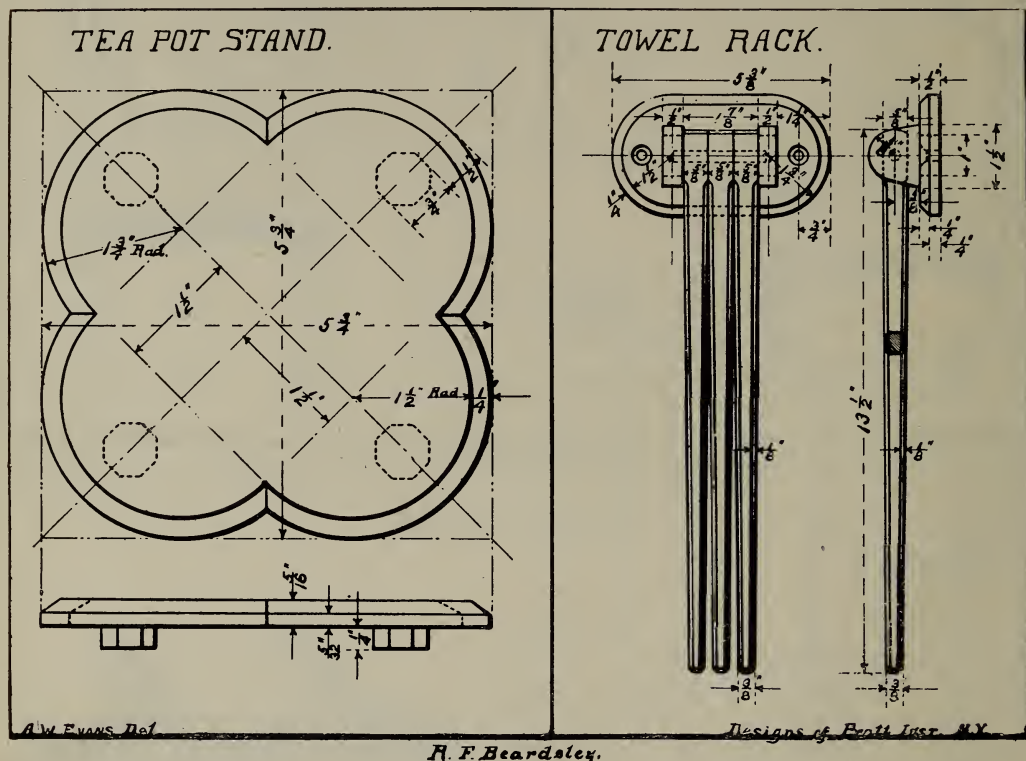
PAPER FILE.

Stock, $\frac{3}{16}$ " Bass and Cherry.

Make the small top piece of Cherry and glue in place.

Fit with an 8d nail for a spindle.

No Drawing.



TEA POT STAND.

Stock, $\frac{3}{8}$ " Oak.

An exercise in the use of the chisel and turning-saw.

The planing of the board to $\frac{5}{16}$ thick should be made a leading feature.

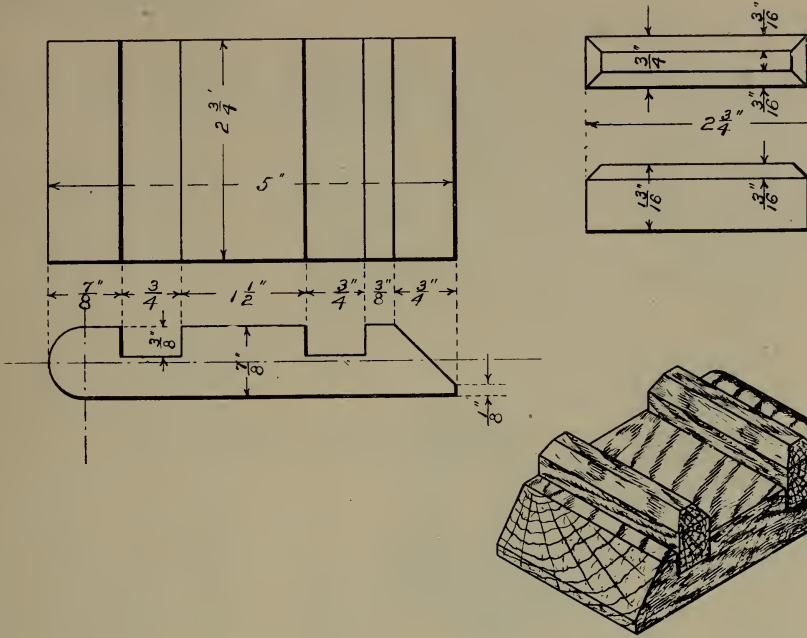
Drawing as shown.

TOWEL RACK.

Stock, $\frac{1}{2}$ Oak for back and brackets; $\frac{7}{8}$ " Oak for arms.

Drawing of details.

SAND PAPER BLOCK

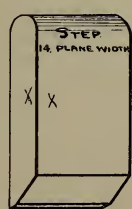
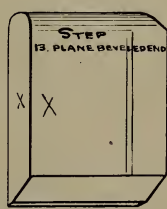
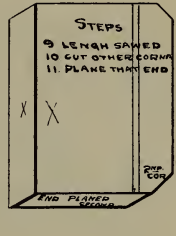
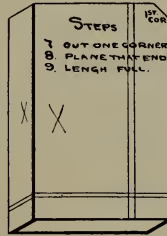
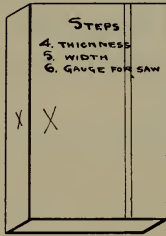
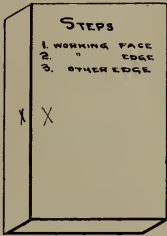


A. W. Evans Del.

R. F. Beardsley.

SAND PAPER BLOCK

Showing Process Of Construction.



DIRECTIONS: SEE BACK OF DRAWING.

DIRECTIONS.

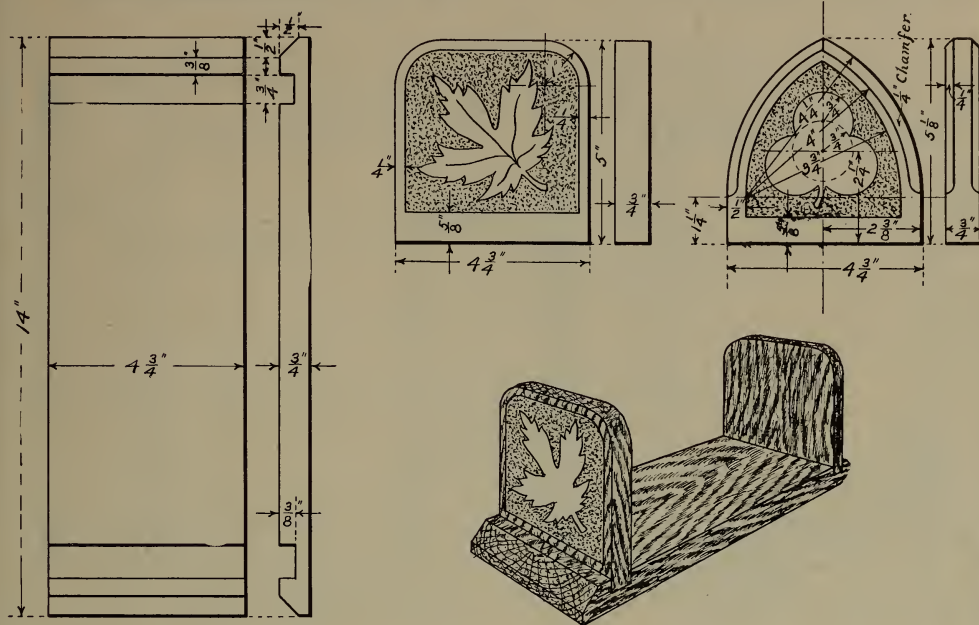
SAND PAPER BLOCK.

1. Plane the working face and mark it X.
2. Plane the working edge and mark it II.
3. Plane the other edge.
4. Gauge the thickness on *both edges* and plane to gauge-lines.
5. Gauge the width (do not plane).
6. Gauge for rip-saw $\frac{3}{16}$ " wide (do not saw).
7. Chamfer one corner (ask teacher which).
8. Plane this end *square*.
9. Measure length and mark with a knife-line.
10. Saw off.
11. Chamfer.
12. Plane this end.
13. Mark and plane the curved end.
14. Mark and plane the beveled end.
15. Saw and plane to the width.

FINISH.

1. Measure and mark gains on W. F. (use knife-lines).
2. Carry the lines down both edges.
3. Gauge the depth of the gains.
4. Saw between the lines, at a little distance from them (cut nearly to gauge-lines).
5. Chisel carefully to the lines.
6. Make wedges.

BOOK RACK No 2.

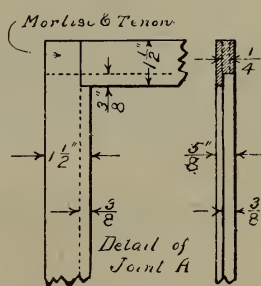
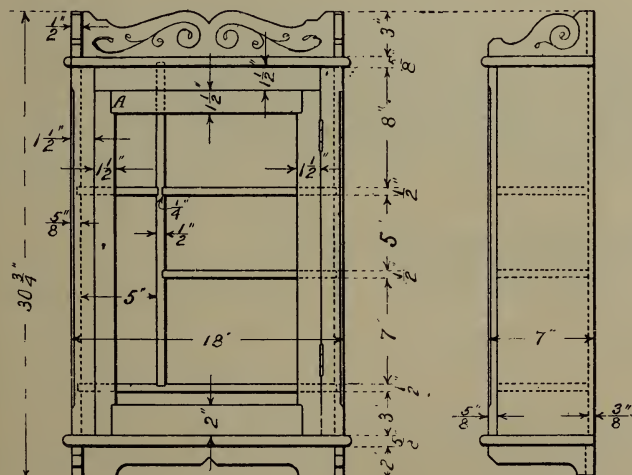


A. W. Evans Del.

R. F. Beardsley

G. Heche Designer.

MEDICINE CABINET

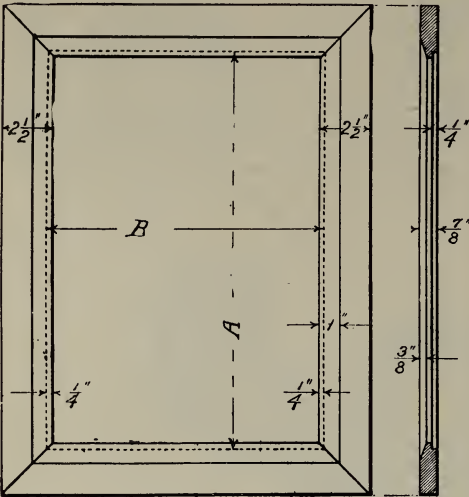


A. W. Evans Del.

R. F. Beardsley

Design of
Manual Trng Dept
Washington D.C.

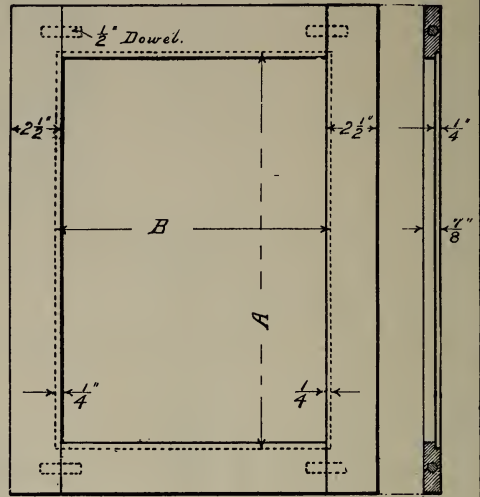
PICTURE FRAME NO. 2.



Make dimensions *A* and *B*
any desired size.

A. W. Evans Del.

PICTURE FRAME NO. 3



Make dimensions *A* and *B*
any desired size.

R. F. Beardley.

DIRECTIONS

PICTURE FRAME No. 1.

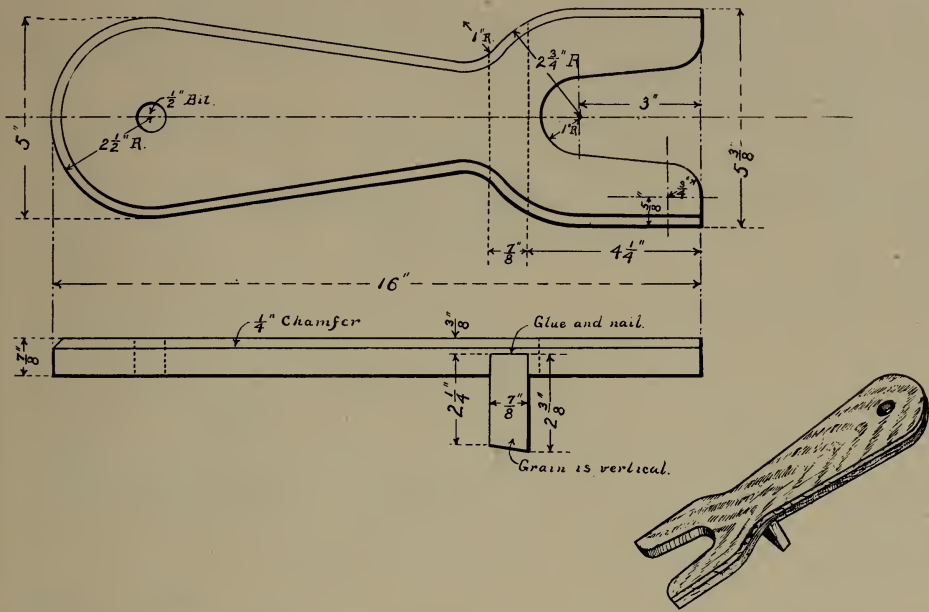
Stock, $\frac{7}{8}$ " Oak.

The dimensions may be varied to suit conditions. In general the severely plain is most pleasing in frames. The mitre saw may be used. **PICTURE FRAME No. 3**, is more suitable for the average boy, the mitre joint being too difficult.

Do not make picture frames of Pine lumber.

No Drawing.

BOOT JACK.



R. F. Beardsley.

DIRECTIONS.

BOOT JACK.

Stock, $\frac{7}{8}$ " x 6" x 20" Oak or Birch.

1. Plane one edge and one end.
2. Gauge width and centre line.
3. Lay off curves on one side and the lines for mortise on the opposite side, taking all measurements from the planed edged and end.
4. Plane to width.
5. Saw nearly to curves with turning-saw and finish with spokeshave and files.
6. Square lines on each edge for mortise and gauge the depth of mortise.
7. Saw and chisel mortise, fitting it to thickness of waste piece at end which is to be used in making the brace.
8. Mark lines for chamfer on edges with gauge and on top with thumb-gauge.

9. Bore hole.

10. Fit the brace or cleat, being particular that the bevel end will rest firmly on floor when in position for use.

The bevel end of brace should be very carefully planed and tested with the T Bevel and try-square.

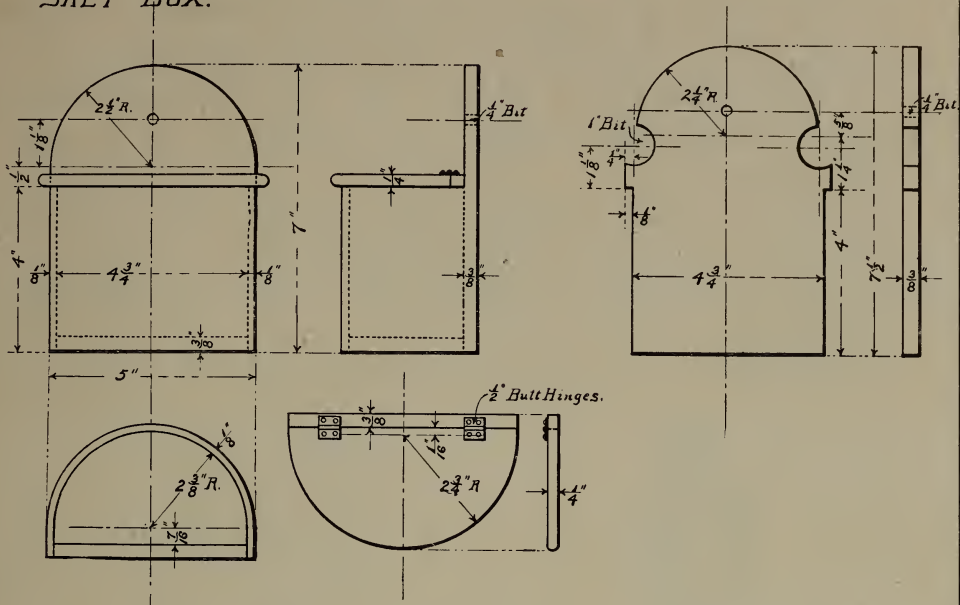
11. Glue and nail together.

12. Clean and finish with shellac.

Use wood-filler on Oak before using shellac.

General Drawing.

SALT BOX.



Scale Half Size.

A. W. Evans Del.

R. F. Beardsley.

A. J. Brashman Designer.

DIRECTIONS.

SALT BOX.

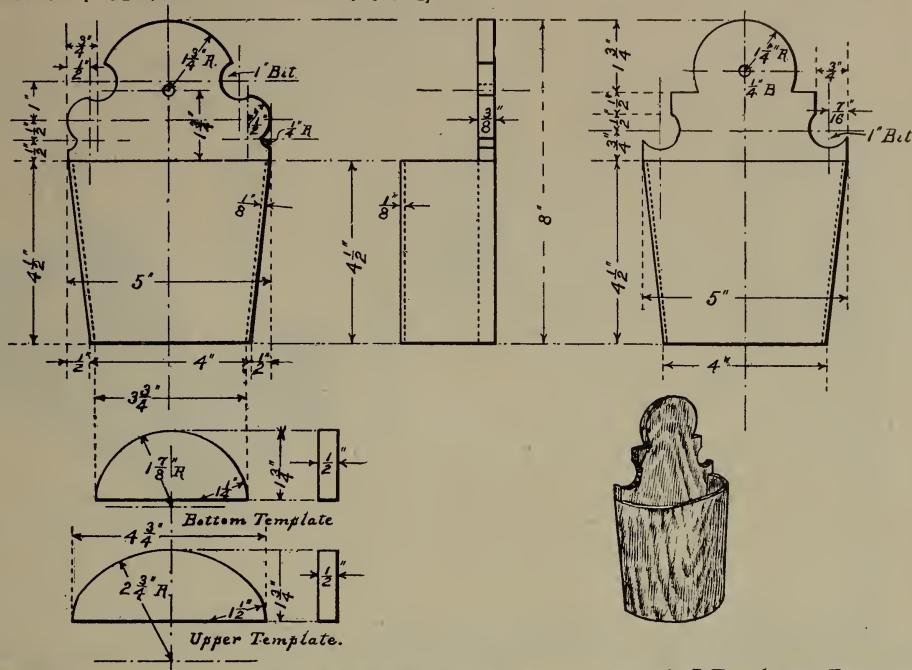
Stock, $\frac{1}{2}$ " x 6" x 16" s. 2 s., Pine and $\frac{1}{8}$ " Basswood.

1. Plane tried edge and gauge width.
2. Saw off near gauge-line, saving the narrow strip for the rail to which cover will be hinged.
3. Plane to gauge line and lay off the back with compass and knife-lines.
4. Saw off and finish back with plane and chisel, then gauge and plane to required thickness.
5. Make two bottom pieces in the same way as above, one to be used to hold the basswood in shape at top while it is drying.
6. Make cover and rail and fasten together with hinges.
7. Fasten base to back.
8. Prepare Basswood by planing to correct length but leaving the width greater than is required.

9. Soak the Basswood in water for at least one hour.
10. At this point design and apply ornamentation to top of the back: (either punching or chip carving may be used.)
11. Fasten Basswood at one edge and carefully bend to shape around the base and the extra base piece which is to be inserted at top.
12. Fasten in this position with a cord but do not glue and nail to place until Basswood is thoroughly dry.
13. Fasten with brads and glue and clean with sand paper.
14. Shellac.

General Drawing.

WHISK BROOM HOLDER No. 2.



A. W. Evans Del.

H. F. Beardsley

A. J. Brockman Design

DIRECTIONS.

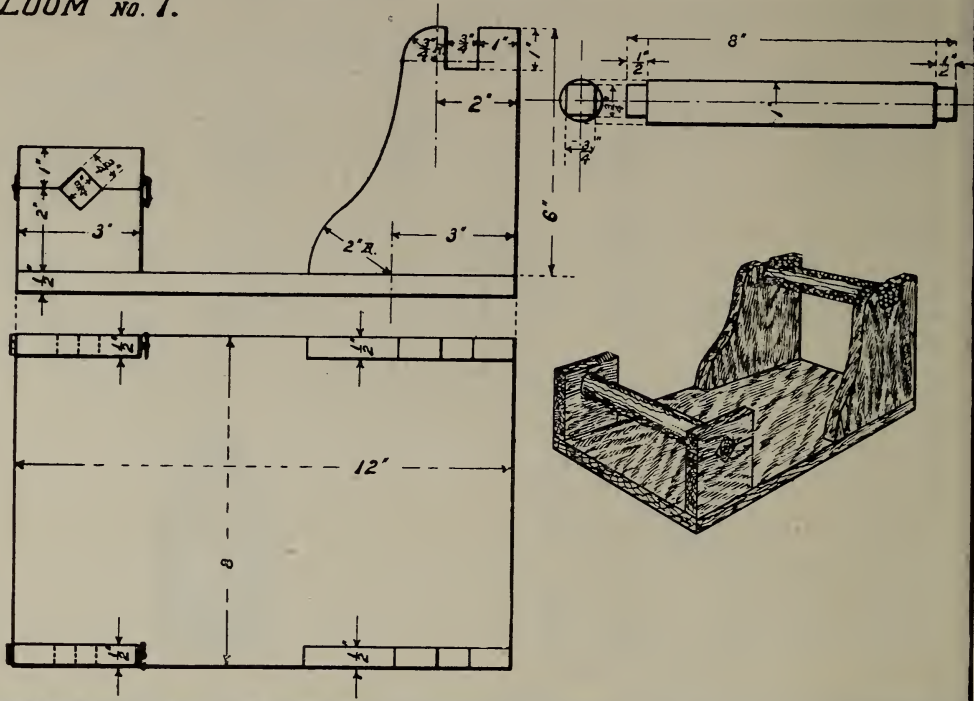
WHISK BROOM HOLDER No. 2.

Stock, $\frac{1}{2}"$ Pine and $\frac{1}{8}"$ Basswood.

The directions for this exercise are practically the same as for the Salt Box.

Draw details as shown.

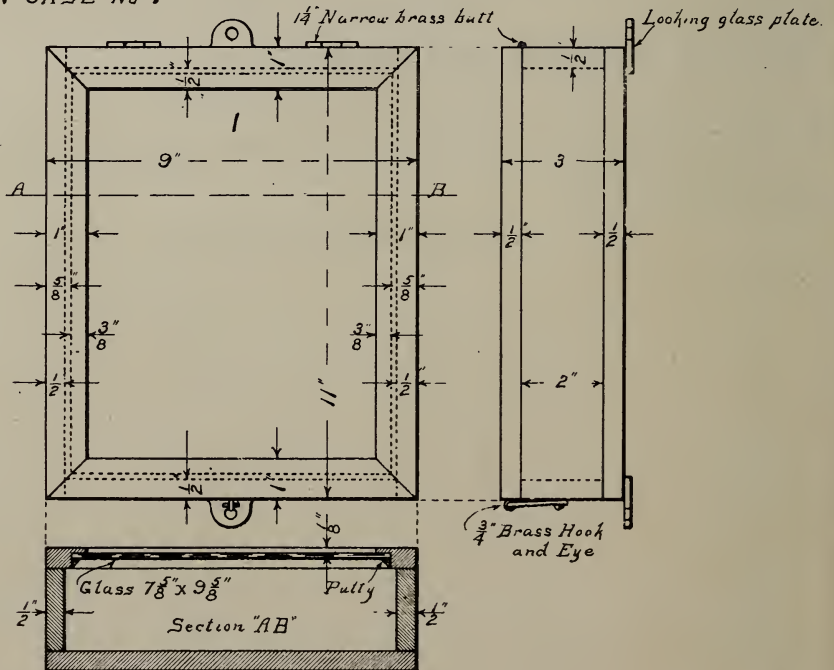
LOOM No. 1.



A. W. Evans Det.

H. F. Beardsley

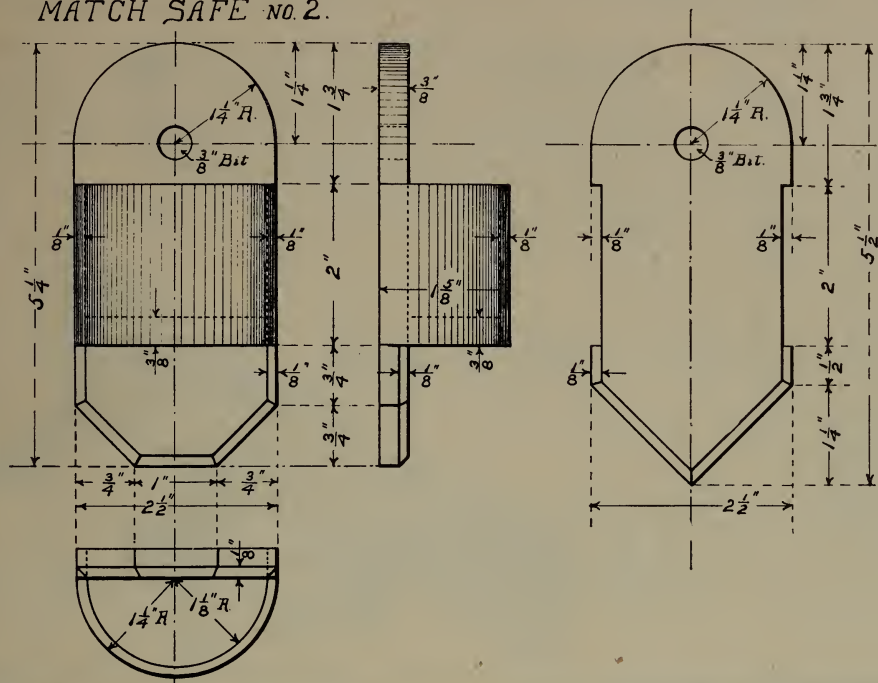
SPECIMEN CASE NO 1



A W Evans Del.

A F Hearsley

MATCH SAFE No. 2.



DIRECTIONS.

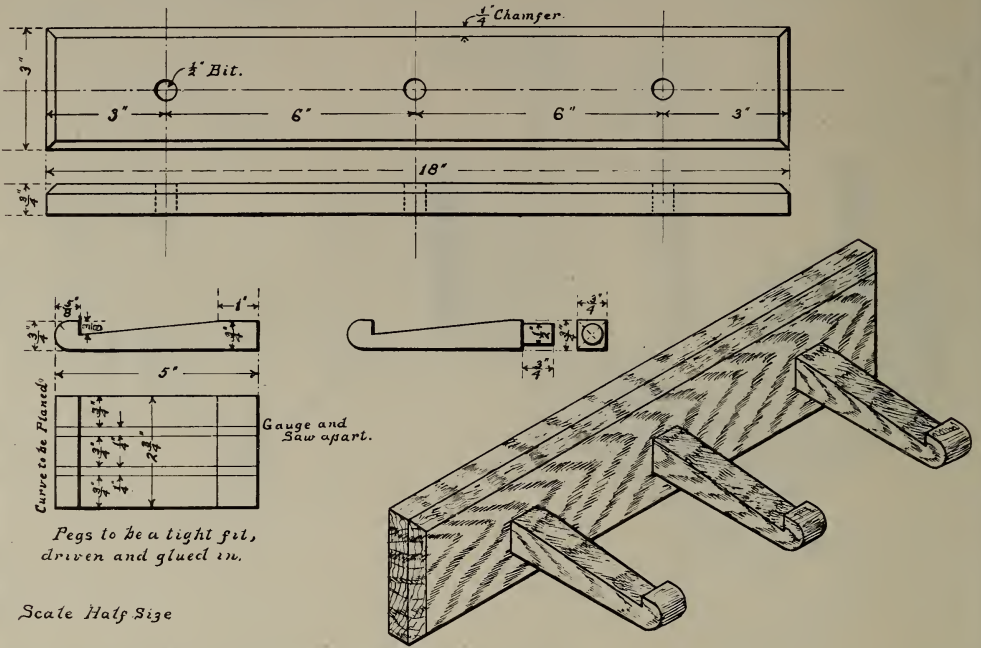
MATCH SAFE No. 2.

Stock, $\frac{3}{8}"$ Whitewood and $\frac{1}{8}"$ Bass.

The directions given for the Salt Box will apply to this exercise. Decorate by background punching, chip-carving or by inlaying with colored veneer.

Detail Drawing.

HAT RACK.



A. W. Evans Del.

R. F. Beardsley.

DIRECTIONS.

HAT RACK.

Stock, $\frac{7}{8}$ " x $3\frac{1}{2}$ " x 24" s. 2 s. Pine.

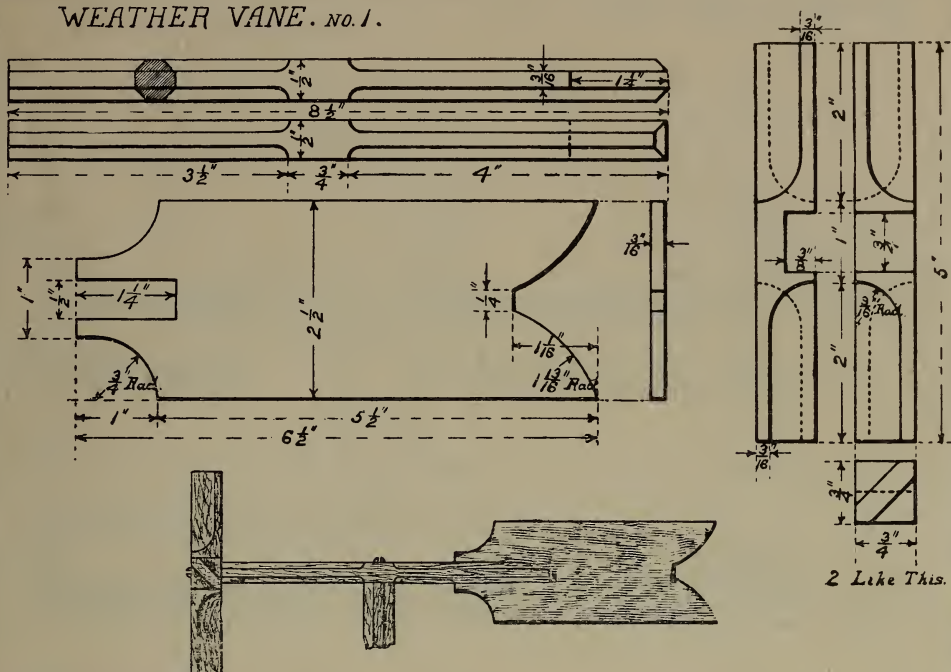
The back is intended as an exercise in planing and as a basis for decoration either by means of chip-carving or background punching.

The pegs are to be made as shown in drawing and are intended as strictly a chisel exercise.

The pegs may be wedged, in addition to glueing.

General Drawing (not shown.)

WEATHER VANE. No. 1.



2 Like This.

A. W. Evans. Del.

Design of Pratt Inst. N.Y.

R. F. Beardsley.

DIRECTIONS.

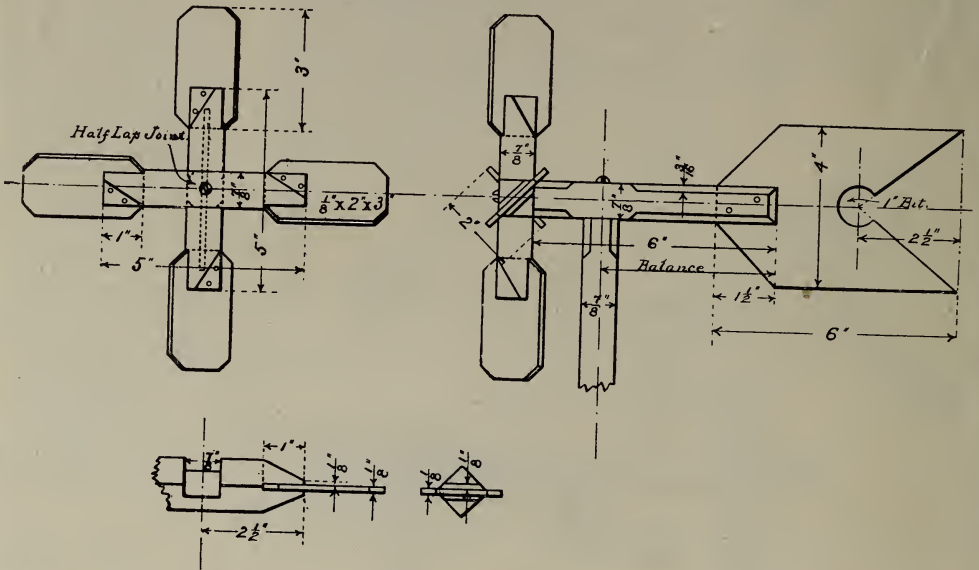
WEATHER VANE No. 1.

Stock, $\frac{7}{8}$ " Pine and $\frac{3}{16}$ " Bass.

The forming of the arms of the wheel and the chamfering of horizontal end post are to be done with the knife.

General Drawing.

WEATHER VANE No 2.



A.W. Evans Del.

R.F. Beardsley.

Chas. O. Evans Design.

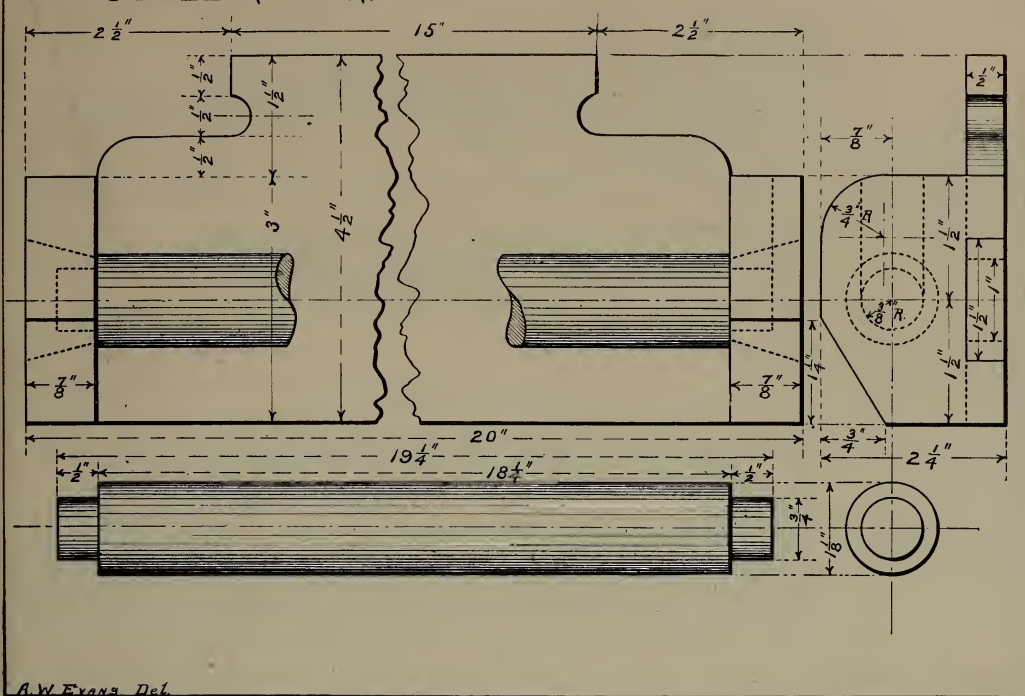
DIRECTIONS.

WEATHER VANE No. 2.

Stock, $\frac{7}{8}"$ Pine and $\frac{1}{8}"$ Bass.

No Drawing.

TOWEL ROLLER.



GENERAL DIRECTIONS.

TOWEL ROLLER.

Stock, $\frac{1}{2}$ " x 5" x 21" s. 2 s., Pine, $\frac{7}{8}$ " x 3" x 7" s. 2 s., Pine, $1\frac{1}{4}$ " x $1\frac{1}{4}$ " x 20" Rough Gum.

1. Plane stock for the back to size on edges and ends.
2. Lay off curves and dovetails as per drawing, using only gauge, compass and knife-lines.
3. Bore holes for concave curves at top.
4. Saw out with back-saw and finish with chisel, being particular that the sides and shoulders of dovetails are square with the face.
5. Plane stock for brackets on edges and ends to a greater length than will be required for both brackets and to a width of $2\frac{1}{4}$ ".
6. Mark out both brackets on this piece with knife and

gauge-lines, so that the ends already planed will serve for the top surface of each.

7. Chisel curve and test with try square.
8. Bore holes $\frac{1}{2}$ " deep and groove one bracket as shown.
9. Saw apart and plane to lines.
10. Mark mortises by laying on the dovetail already made and scribing with knife.
11. Square and gauge depth of mortise.
12. Saw exactly to lines and remove stock with chisel.

THE ROLLER.

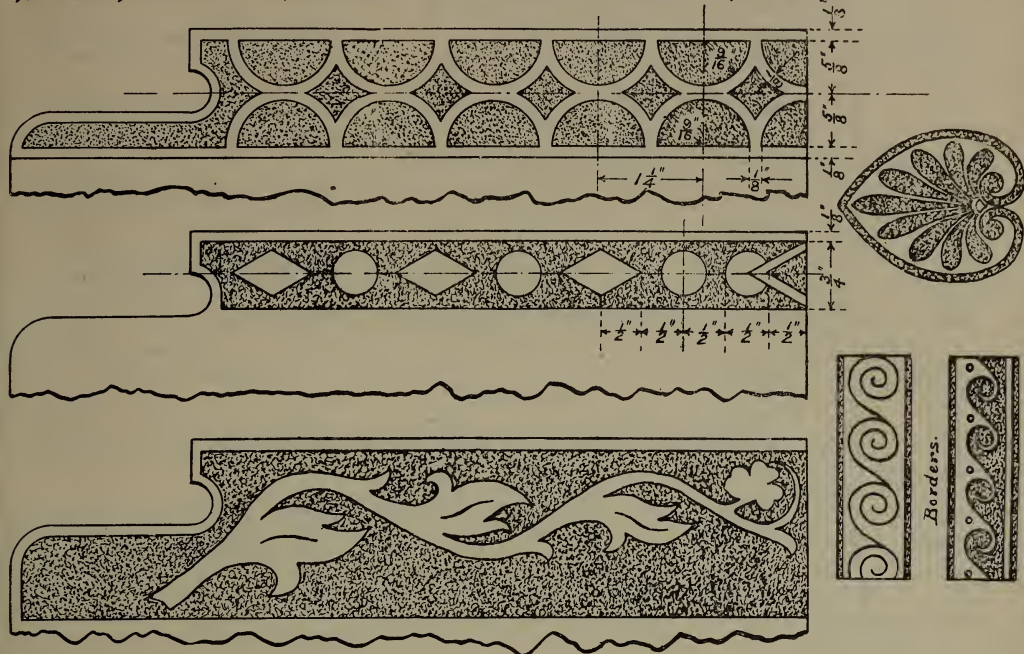
1. Cut square bar to required length.
2. Find centre of square bar at the ends by drawing diagonals.
3. Scribe both circles at each end.
4. Draw lines on end of bar tangrent to large circles cutting the corners at about 45 degrees.
5. The ends of these lines may be connected by gauge lines on the length of the bar.
6. Plane to octogonal form, requiring that this preliminary work be accurate.
7. Plane to circle.
8. Saw and chisel small ends.
9. Finish roller with sand paper.

NOTE.—The back is now to be decorated either by means of chip carving or background punching.

10. Clean and glue together.
11. Shellac.

DRAWING.—The drawing for this exercise should consist of details of each part separately, and not as given in above drawing except for advanced pupils.

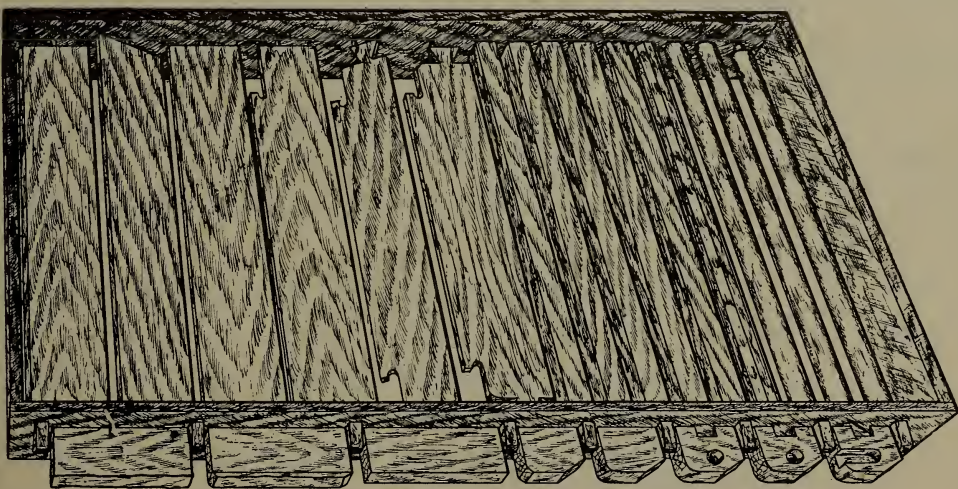
SUGGESTIONS FOR ORNAMENTATION OF TOWEL ROLLER.



A. W. Evans Del.

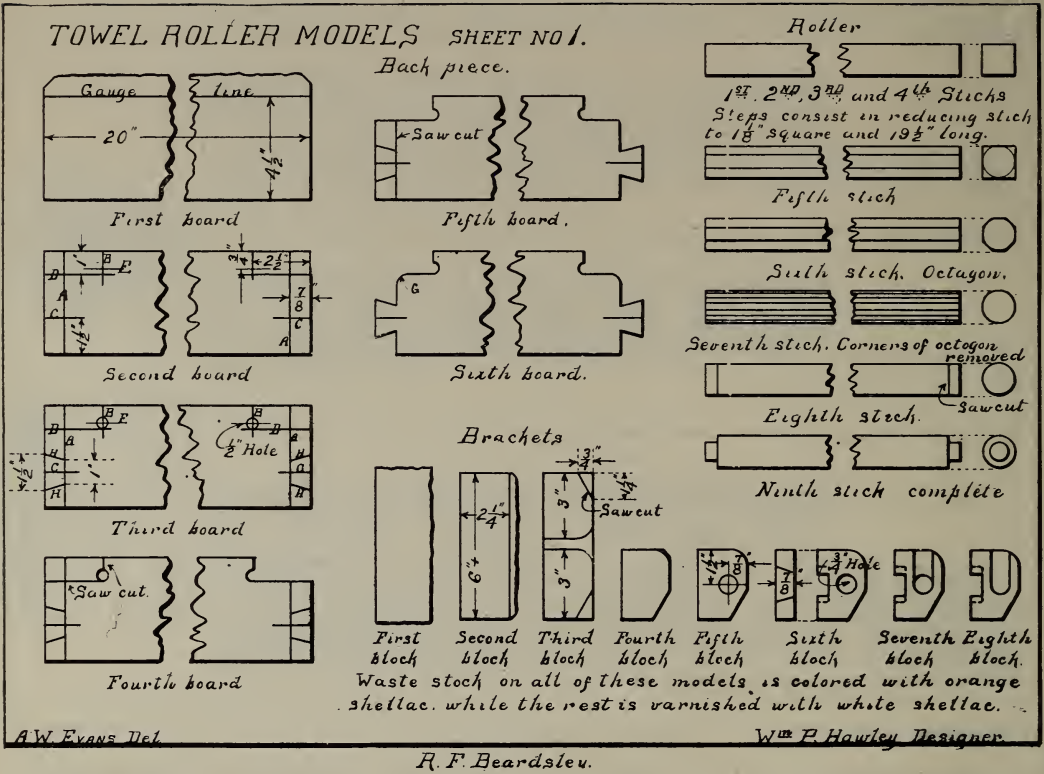
R. F. Beardsley.

TOWEL ROLLER MODELS SHEET NO. 2.



A. W. Evans Del.

 Wm. P. Hawley Designer.
 R. F. Beardsley.



DETAIL DIRECTIONS FOR TOWEL ROLLER. TO BE PLACED ON TEACHERS SET OF MODELS.

BACK.

- | | | | |
|------------|---|----|--|
| 1st board. | } | 1. | <ol style="list-style-type: none"> 1. Plane a working face, mark it X, use smoothing plane. 2. Plane a tried edge, mark it X, use jack-plane set very fine. 3. Plane other face, do not mark it, use smoothing plane. 4. Plane a tried end, mark it X, use smoothing plane. 5. Square off 20" from tried end with knife line. 6. Saw off 1 1/2" outside of line. 7. Chamfer corner opposite tried edge and plane this end to line. 8. Gauge width. 9. Saw and plane to width. |
|------------|---|----|--|

- | | | |
|------------|---|---|
| 2nd board. | { | 10. Square off knife-lines A-A and B-B. |
| | | 11. Gauge lines C-C, D-D and E-E. |
| 3rd board. | { | 12. Draw circles at F-F with dividers. |
| | | 13. Draw curves at G-G with dividers. |
| | | 14. Mark off dovetails with dividers from centre lines C-C. |
| | | 15. Draw knife lines marked H-H-H-H. |
| 4th board. | { | 16. Bore holes at F-F with Fostner bit. |
| | | 17. Saw to lines B-B and D-D, use back saw. |
| 5th board. | { | 18. Saw to lines H-H-H-H and A-A. |
| 6th board. | { | 19. Round two corners and finish with chisel and file. |

ROLLER.

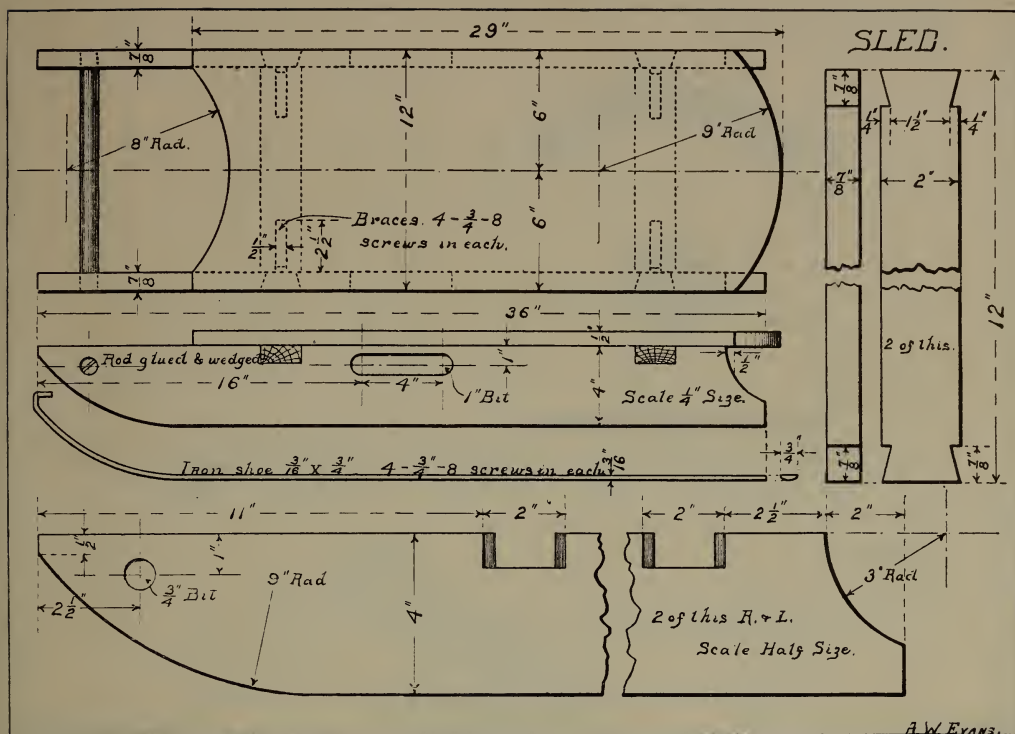
- | | | |
|------------|---|--|
| 1st stick. | { | 1. Plane face No. 1. |
| | | 2. Plane face No. 2. square with No. 1. |
| 2nd stick. | { | 3. Surface off face No. 3. |
| | | 4. Gauge width from No. 2. on No. 1, and on No. 3. |
| 3rd stick. | { | 5. Plane No. 4, to these lines. |
| | | 6. Gauge width from No. 1, on No. 2, and on No. 4. |
| 4th stick. | { | 7. Plane No. 3, to these lines. |
| | | 8. Square around each end with knife-line making stick correct length. |
| 5th stick. | { | 9. Saw ends to these lines, use back-saw. |
| | | 10. Draw diagonals on ends. |
| | | 11. Draw circles on ends with dividers. |
| | | 12. Mark chamfers on ends. |
| | | 13. Gauge chamfers on sides. |
| 6th stick. | { | 14. Plane corners to gauge lines. |
| 7th stick. | { | 15. Plane off corners again, use smoothing plane. |

- | | | | |
|---------------|---|-----|--|
| 8th
stick. | { | 16. | Plane off corners again with smoothing plane. |
| | | 17. | Round stick with plane and strip of sand paper. |
| | | 18. | Draw small circles on ends. |
| | | 19. | Mark off shoulders with gauge. |
| 9th
stick. | { | 20. | Saw down shoulders, do not saw too deeply. |
| | | 21. | Work small ends with chisel. |
| | | 22. | Finish small ends with file, and saw to $\frac{1}{2}$ " in length. |

BRACKETS.

- | | | | |
|---------------|---|-----|---|
| 1st
block. | { | 1. | Plane working face, and mark it. |
| | | 2. | Plane tried edge, and mark it. |
| | | 3. | Plane other face. |
| 2nd
block. | { | 4. | Chamfer corners opposite tried edge, use plane. |
| | | 5. | Plane both ends square. |
| | | 6. | Gauge width from tried edge on both faces. |
| | | 7. | Mark off length from each end with knife-line. |
| | | 8. | Mark off corners with knife-line. |
| | | 9. | Draw curves. |
| 3rd
block. | { | 10. | Plane width to gauge-line. |
| | | 11. | Saw off corners, use back-saw. |
| | | 12. | Saw pieces apart. |
| 4th
block. | { | 13. | Plane to lines on top ends. |
| 5th
block. | { | 14. | Chisel off round corners. |
| | | 15. | Lay out holes, make right and left. |
| 6th
block. | { | 16. | Lay out mortises on both pieces. |
| | | 17. | Lay out roller slot on right hand bracket. |
| | | 18. | Saw mortises and roller slot, use back saw. |
| 7th
block. | { | 19. | Finish out mortises and slot with $\frac{5}{8}$ " chisel. |

Eighth block shows mortise in process of making also position of hole.

**SLED.****DIRECTIONS.**

Stock, $\frac{7}{8}$ " x 9" x 37", s. 2 s., Pine, $\frac{7}{8}$ " x 5" x $12\frac{1}{2}$ ", s. 2 s., Pine.
 $\frac{1}{2}$ " x 13" x 30", s. 2 s., Pine 1" x 1" x 13" rough Ash.

Iron corner braces are furnished.

Iron shoes will be supplied at cost to pupils when desired.

1. Plane both edges of large $\frac{7}{8}$ " board and lay off both runners, using the planed edges for base of runners.

2. Saw apart and finish to lines, but do not mark or cut dovetail mortises.

3. Make dovetail braces and from these scribe the mortises in the runners.

4. Glue and nail dovetail braces to place.

5. Make top and glue and nail to place.

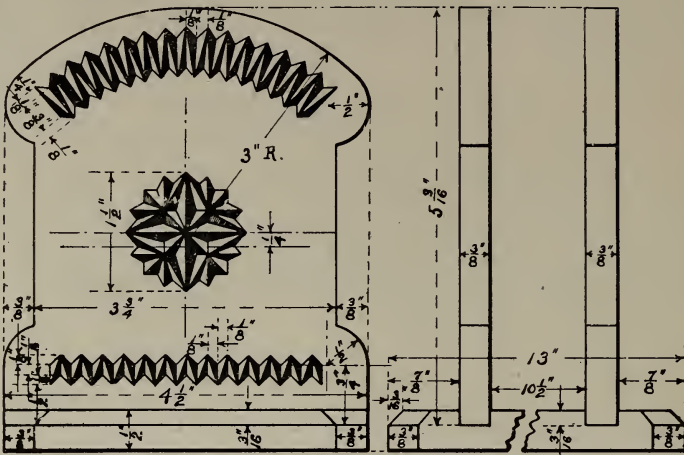
6. Plane the ash rod in the same manner as roller in Towel Roller.

7. Screw on iron corner braces.

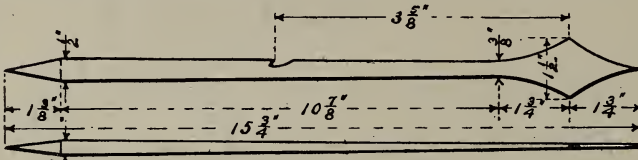
8. Finish with shellac. (No shellac to be used inside).

Detail Drawings.

BOOK RACK NO. 3.



DART.



A. W. Evers Det.

R. F. Beardsley.

Designs of Pratt Inst. N.Y.

DIRECTIONS.

BOOK RACK No. 3.

Stock, Whitewood or Hardwood.

The directions for this are practically the same as for Book Rack No. 2.

No Drawing.

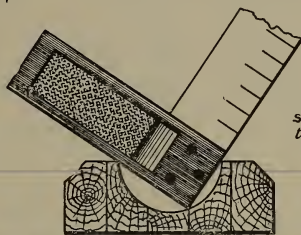
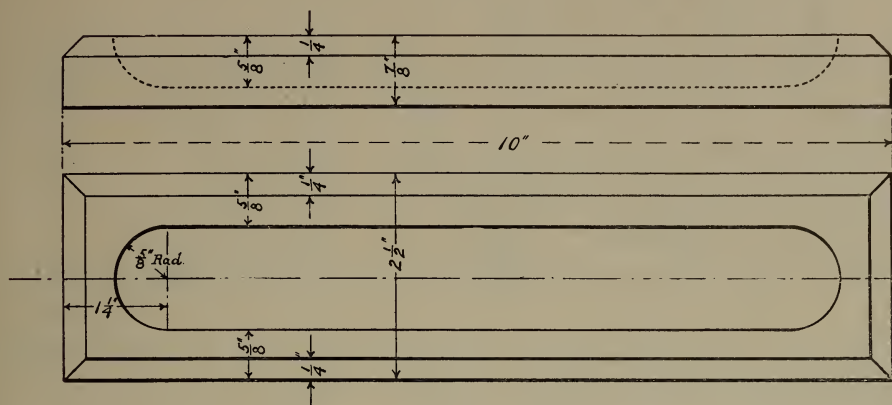
DART.

Stock, $\frac{3}{8}$ " Whitewood.

A whittling exercise.

No Drawing.

PEN TRAY.



To be made of 5 or more alternate strip of light and dark wood 1" thick glued together.

A. W. Evans Del.

R. F. Beardsley.

DIRECTIONS.

PEN TRAY.

Stock, 1" x 2" x 12" rough Pine, 1" x 3" x 12" rough Gum, or a greater variety and a larger number of pieces.

1. Plane one face and one edge of pine board.
2. Gauge and saw off one 1/2" strip and plane to gauge line.
3. Plane one face and one edge of Gumwood board.
4. Gauge and saw off one 1/2" strip and plane to gauge line.
5. Glue together these two strips and proceed as above to prepare another strip which may then be glued on. The working faces should be held as evenly as possible in glueing and should all be on one side.
6. When all five or more strips are glued the face side should be carefully leveled with the smoothing-plane, the

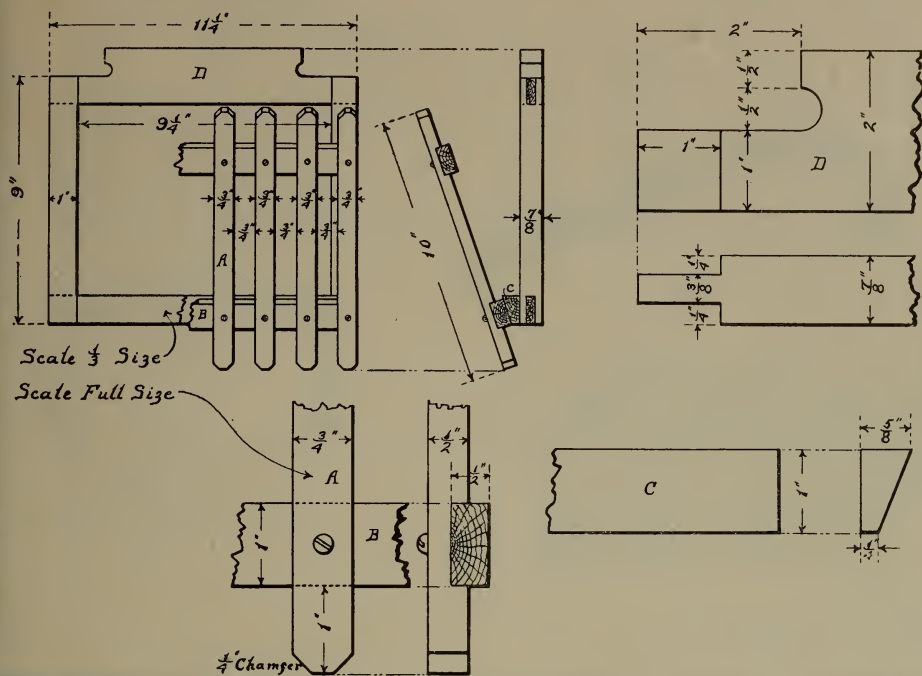
thickness gauged and the opposite face (which is still unplanned) planed to gauge lines.

7. Draw centre line and mark curves.
8. Gauge sides of groove.
9. Gouge curves as shown, (do not use mallet or hammer on gouge.)
10. Scrape with swan-neck scraper.
11. Gauge and plane chamfer.
12. Clean and shellac.

NOTE.—Test semicircle with try-square as shown in sketch above.

DRAWING,—No drawing is required but may be made if the teacher decides that it is best.

PAPER RACK.



A. W. Evans Del.

R. F. Beardsley.

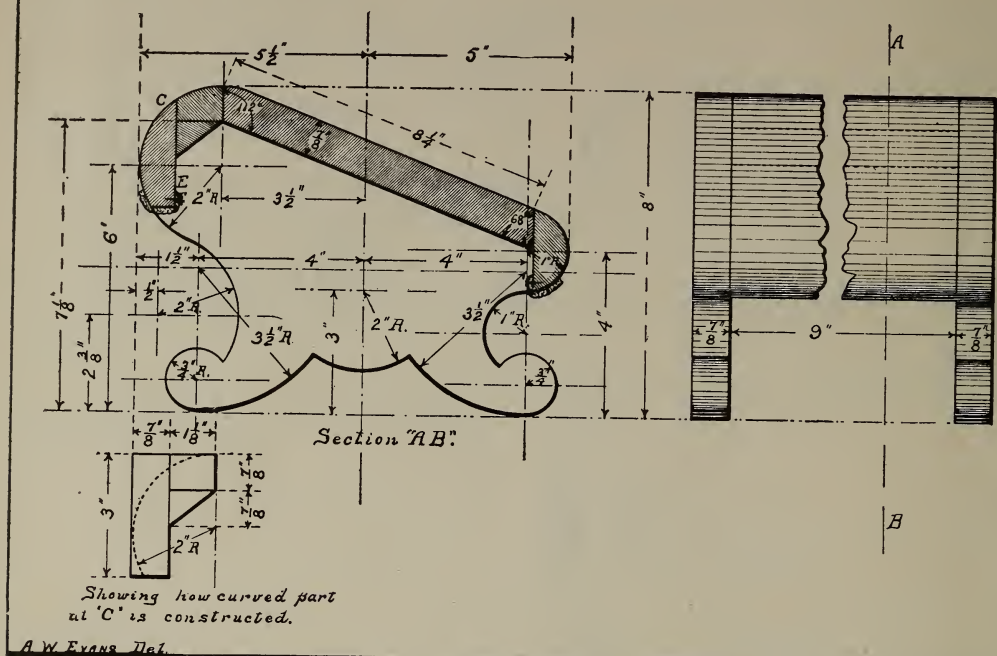
DIRECTIONS.

PAPER RACK.

Stock, $\frac{1}{2}"$ and $\frac{7}{8}"$ Pine.

1. Prepare stock for the frame of back D.
 2. Join as shown or with end lap joints.
 3. Make and fasten piece C to back with glue and nails.
 4. Make rails B and pickets A for front.
 5. Fasten A. & B. with $\frac{1}{2}$ R. H. Brass screws, except the first and last pickets, which will be held to cleat C by $1\frac{1}{4}"$ R. H. Brass screws.
 6. Clean with sand-paper and finish with shellac.
- General drawing as shown.

FOOT STOOL.



R. F. Beardsley.

DIRECTIONS.

FOOT STOOL.

Stock, $\frac{7}{8}$ " s. 2 s. Pine.

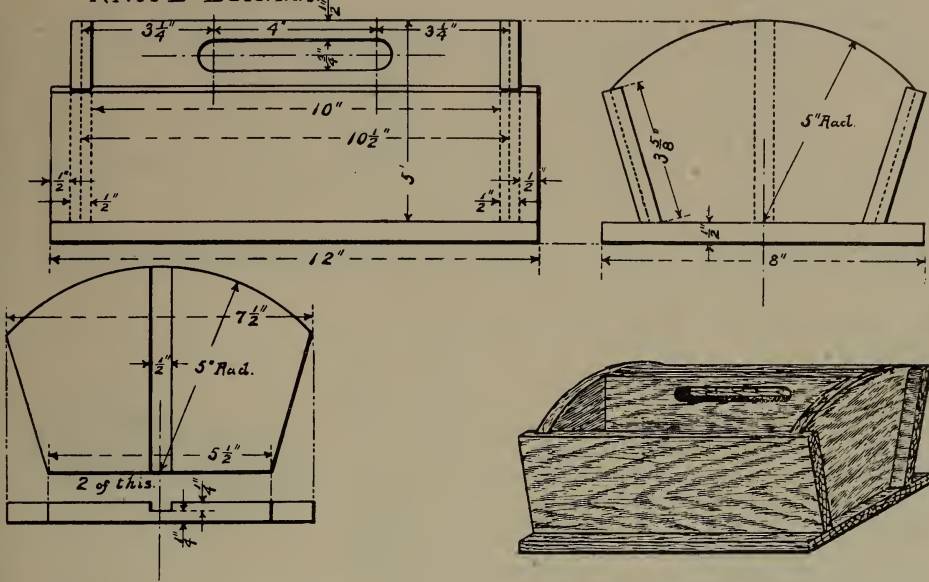
The curved outlines of the sides are to be sawed with a turn-ing-saw, and finish with with file and sand-paper. Each side is to be made separately, that is, one side is not to be used as a template in laying out the other side. This rule in regard to duplication of parts should be insisted upon in all cases.

The bevel is to be used in planing the edges of the top board, 112° and 68° being the required angles.

A cover of carpet may be supplied by the pupil.

Drawing as shown, omitting shading.

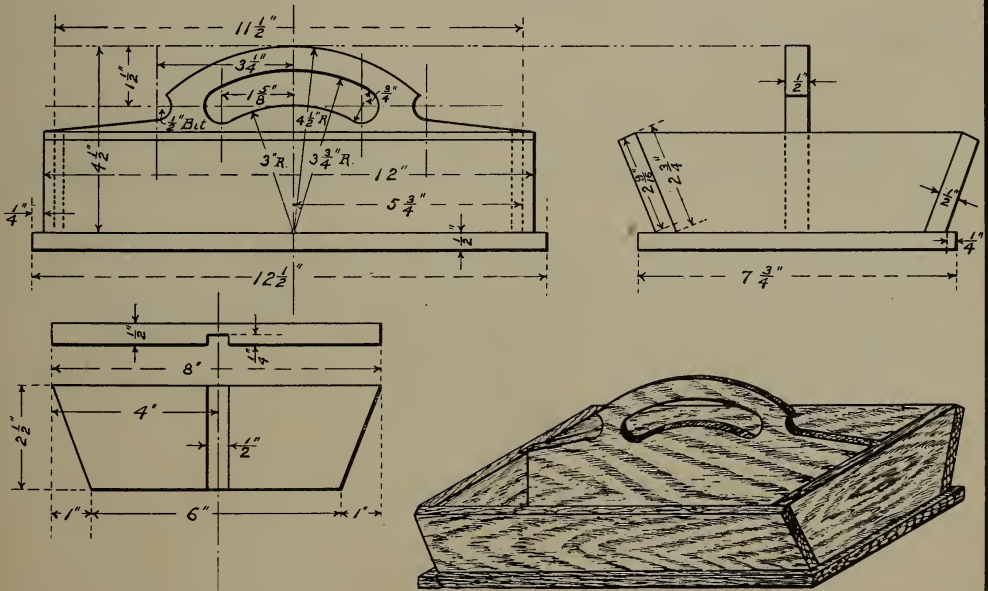
KNIFE BOX NO. 1.



A W Evans Del.

R F Beardsley.

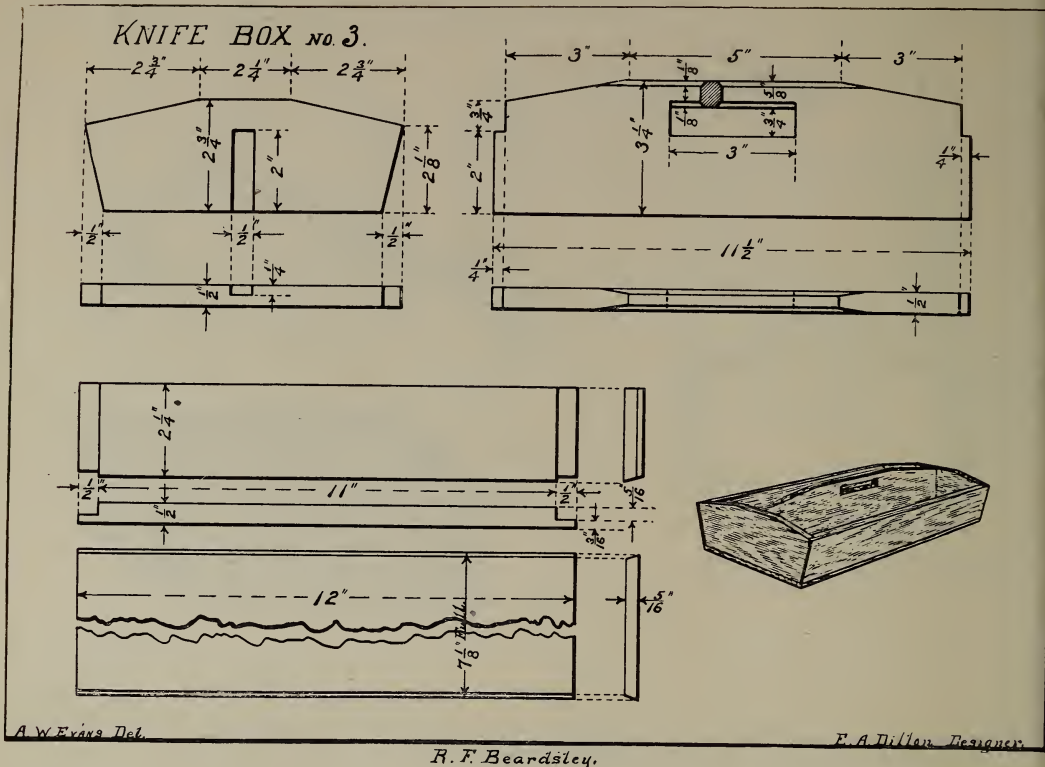
KNIFE BOX NO. 2



A W Evans Del.

R F Beardsley.

Grant Esche Designer.



DIRECTIONS.

KNIFE BOXES.

Stock, $\frac{1}{2}$ s, 2 s., Pine.

A choice is here given of three forms of knife boxes, all having in common the use of the bevel and all illustrating a rabbeted joint.

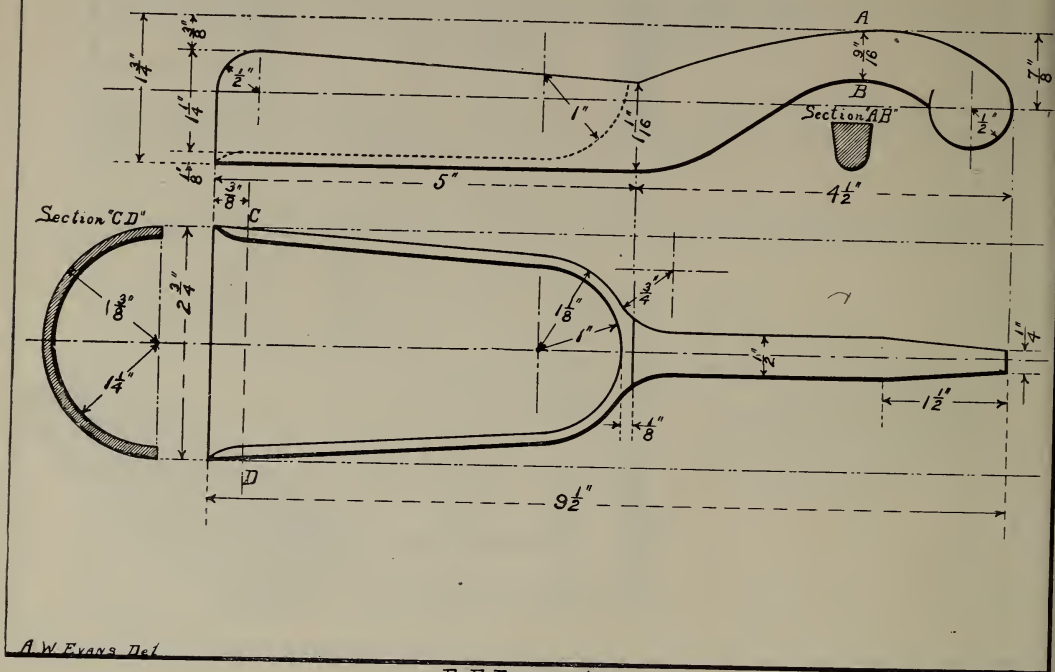
The intention is to have each pupil lay off his own work on a large $\frac{1}{2}$ " board, instead of giving him stock cut approximately to size, thus teaching him economy in the use of material.

The teacher and not the pupil is to make the selection of the design to be used by the entire class.

Drawing.

Detail drawings as shown (no perspective.)

SUGAR SCOOP.



R.F. Beardsley.

DIRECTIONS.

SUGAR SCOOP.

Stock, 2" x 3" x 10" s. 4. s., Birch, or several pieces glued together.

1. Draw side elevation on 2" face of block and saw nearly to lines.
2. Draw plan on 3" or top face of block and saw nearly to lines of handle leaving sides of scoop parallel until after gouging is finished.
3. Gouge inside of scoop and finish with scraper.
4. Complete sawing nearly to lines of top view.
5. The remainder of this exercise is to be done free-hand using the gauge, knife, spokeshave and file.
6. Remove all tool marks with sand-paper and finish with shellac.

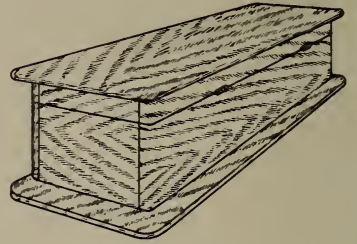
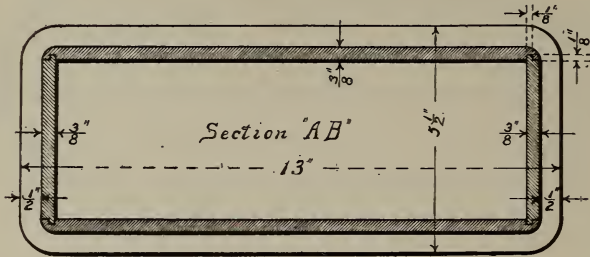
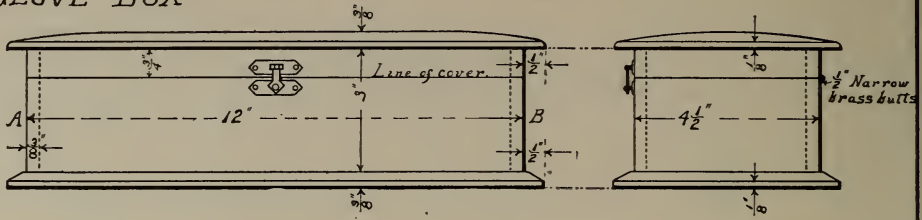
NOTE.—Great care should be used in forming the curves

which join the handle and scoop as the tendency is to make them too abrupt.

Drawing.

The drawing of this exercise is optional with the teacher.

GLOVE BOX



A.W. Evans Del.

A.W. Evans Designer.

R. F. Beardsley.

DIRECTIONS.

GLOVE BOX.

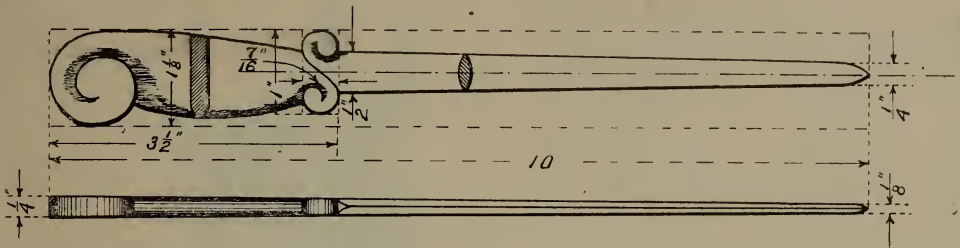
Stock, $\frac{5}{8}$ " Oak or other Hardwood.

1. Prepare stock for sides and ends in the usual way.
2. Mark gains and cut out with back saw.
3. Fit ends to sides and glue together being careful that box is square.
4. Prepare top and base, then, after trueing the edges of box, glue top and base in position
5. Fill and finish with four or five coats of shellac rubbed down with pumice stone and water.
6. Mark "line of cover" and saw apart.
7. Plane away saw marks and fit on hinges and catch.

NOTE.—A lining of colored silk or satin may be placed in box when finished.

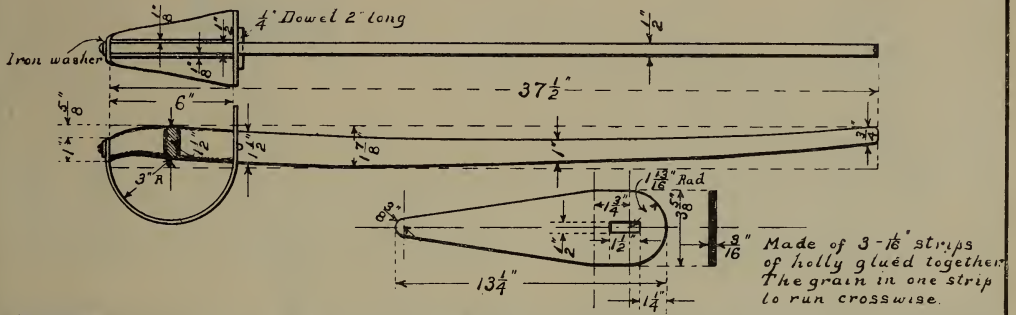
General Drawing and Section.

LETTER OPENER NO. 3



Chas S. Irons Designer

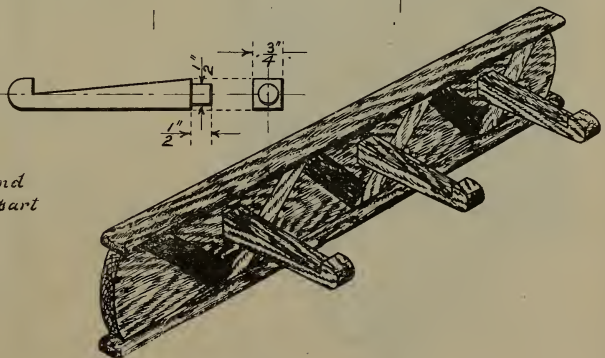
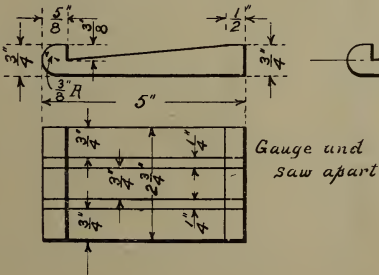
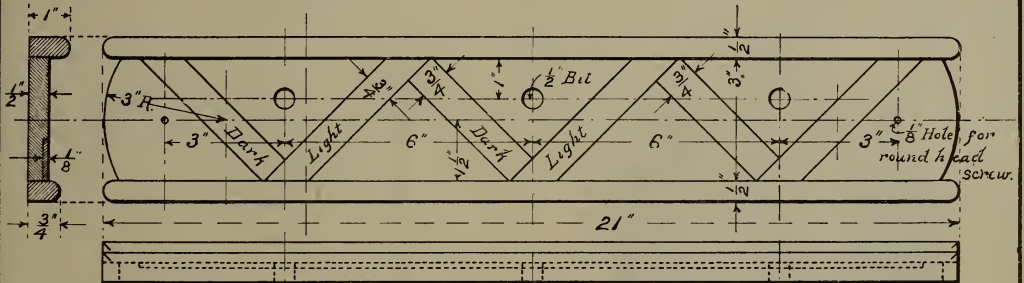
FENCING SABER.



A. W. Evans Del.

R. F. Beardsley

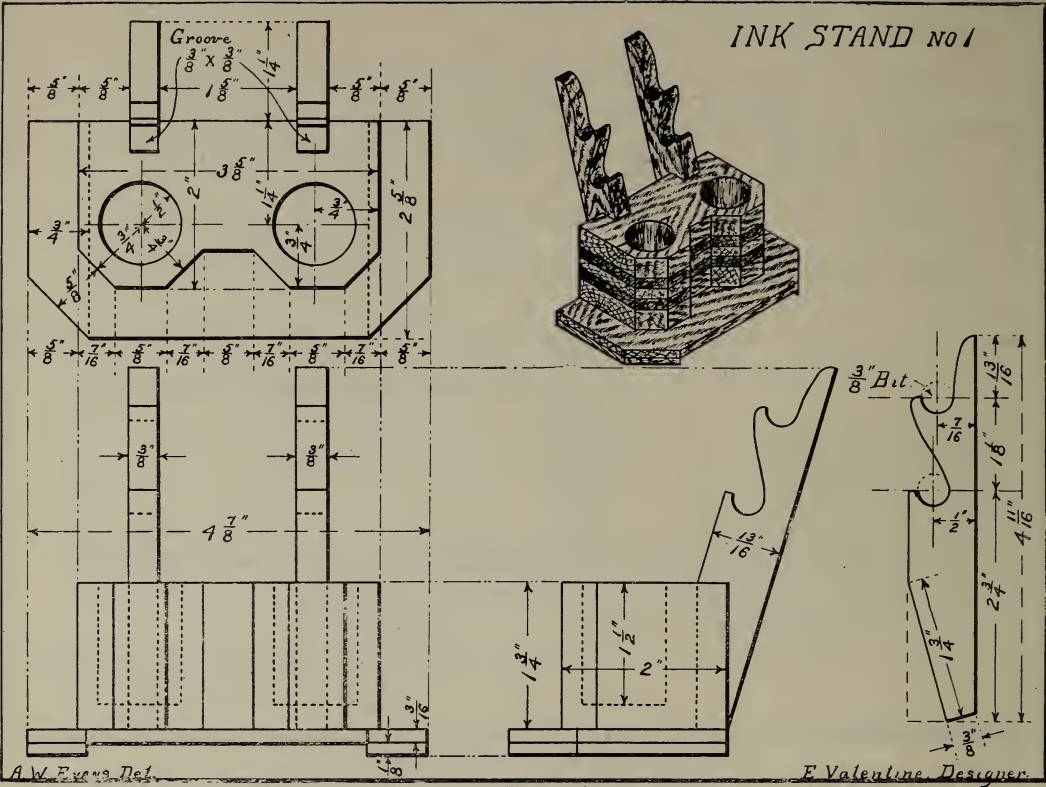
INLAID HAT RACK



A. W. Evans Del.

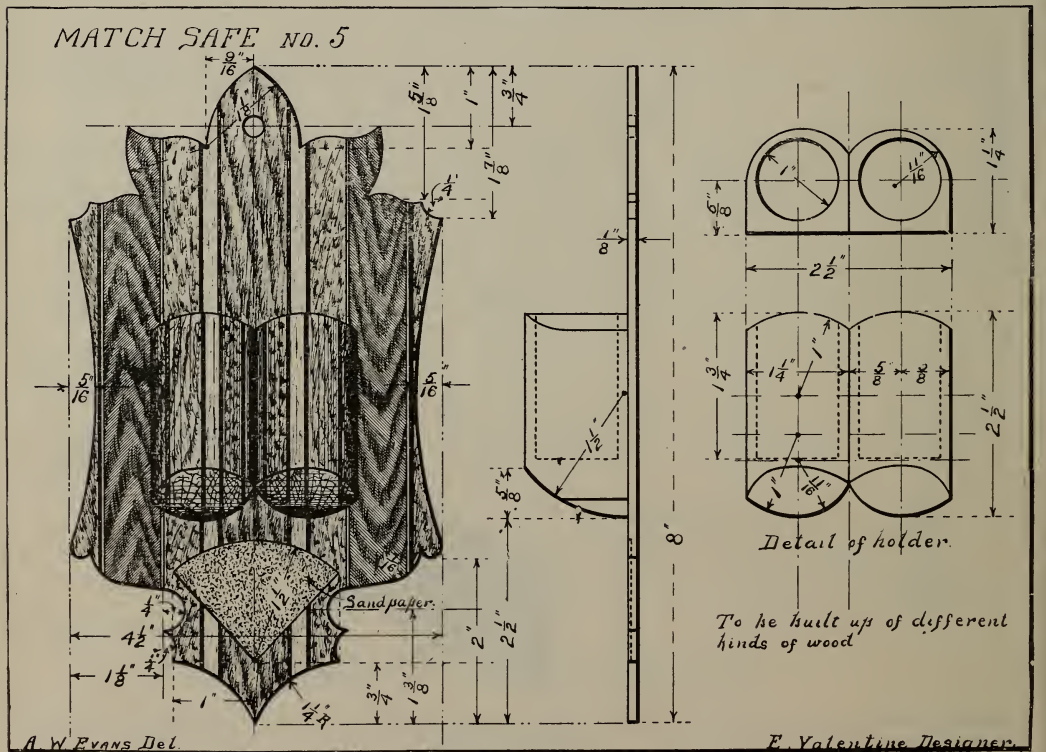
R. F. Beardsley

INK STAND NO 1

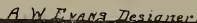


R. F. Beardsley.

MATCH SAFE NO. 5



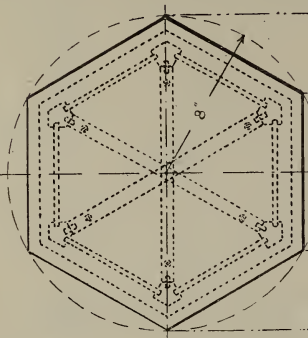
R. F. Beardsley.



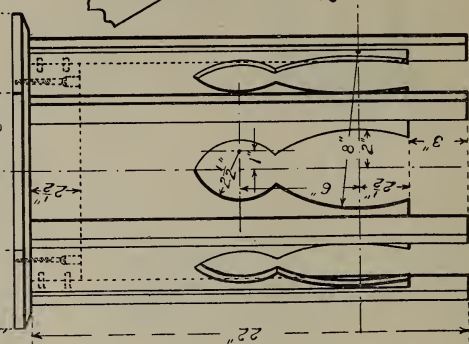
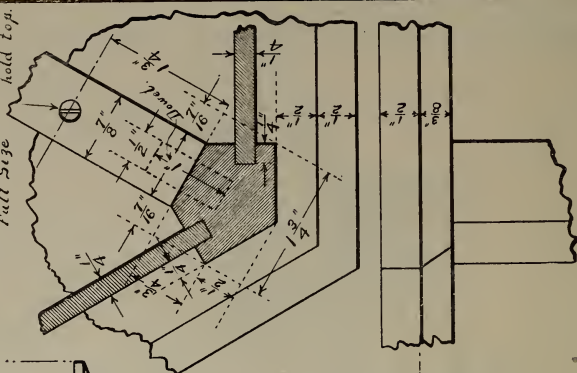
A. W. Evans Del

R. F. Beardsley.

HEXAGONAL TABOURET SHEET NO.



Detail of leg
Full Size

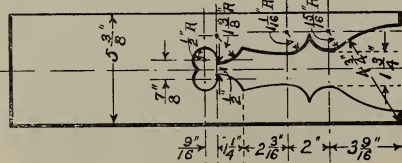
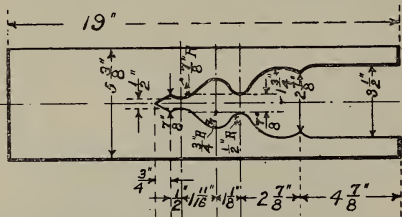


M. M. Friedman Designer

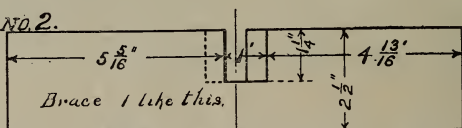
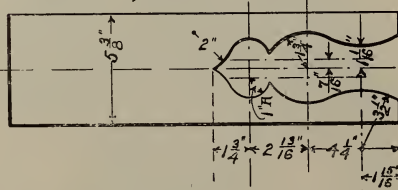
R. F. Bearasley.

A. W. Evans Del.

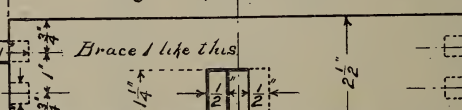
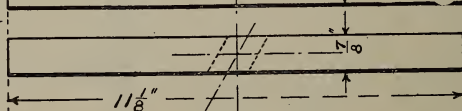
HEXAGONAL TABOURET SHEET NO. 2.



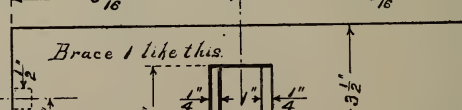
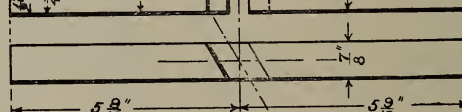
Panels 6 of style selected



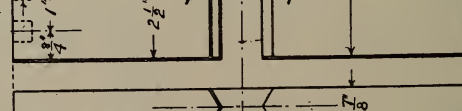
Brace 1 like this.



Brace 1 like this.



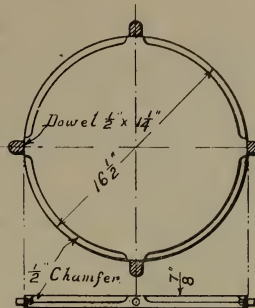
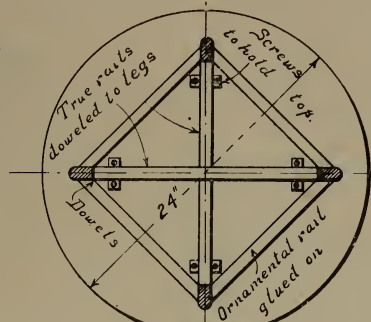
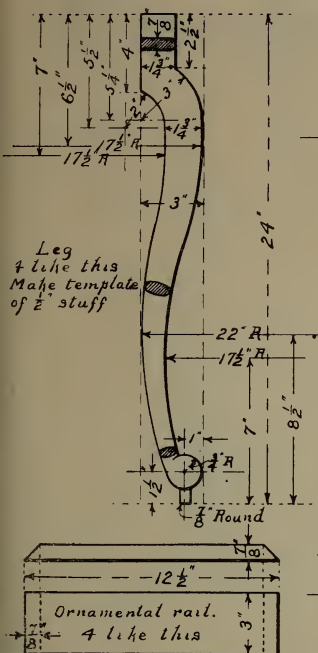
Brace 1 like this.



A. W. Evans Del.

R. F. Bearasley.

TABLE

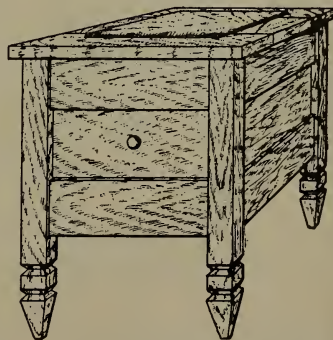
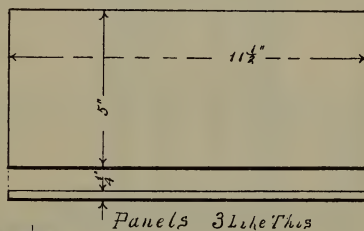
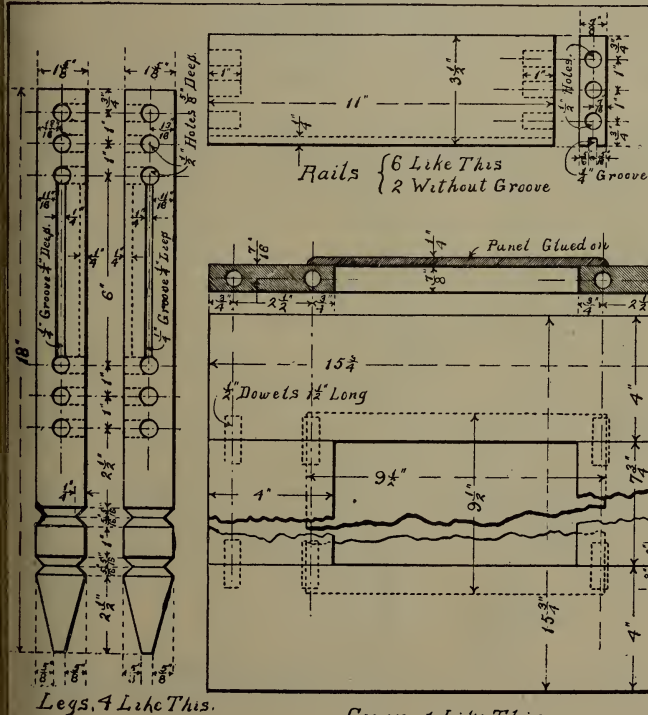


A. W. Evans Dei

G. Beebe DeYoung

RF Beardsley

BLACKING CASE SHEET 1.



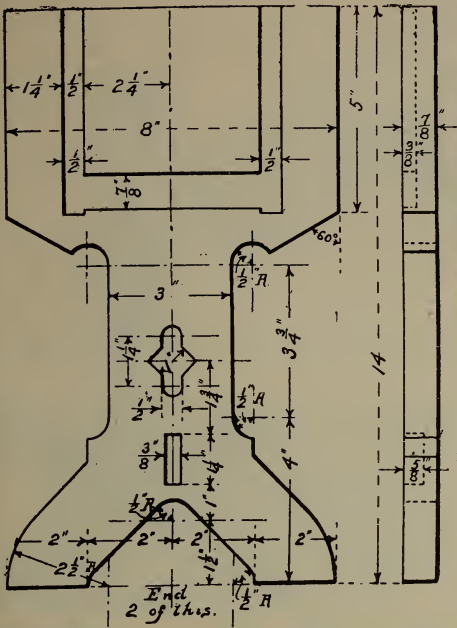
Cover 1 Like This.

Scale $\frac{3}{8}'' = 1'$

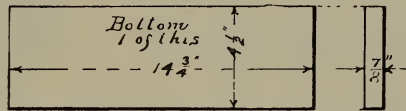
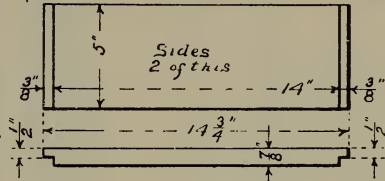
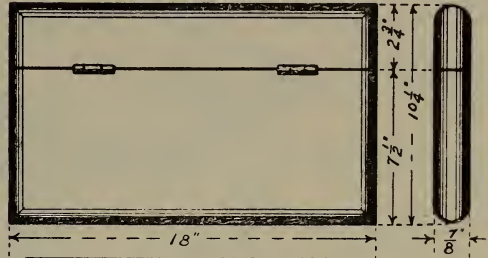
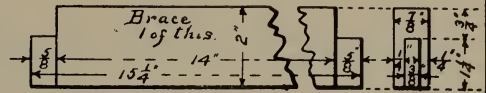
A. W. Evans Del.

Designed by Grant Heeb

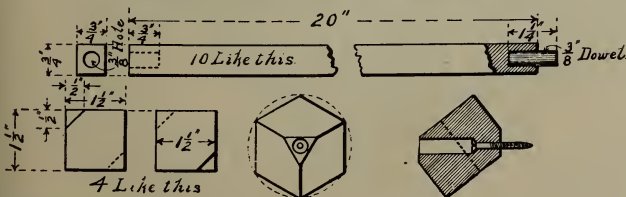
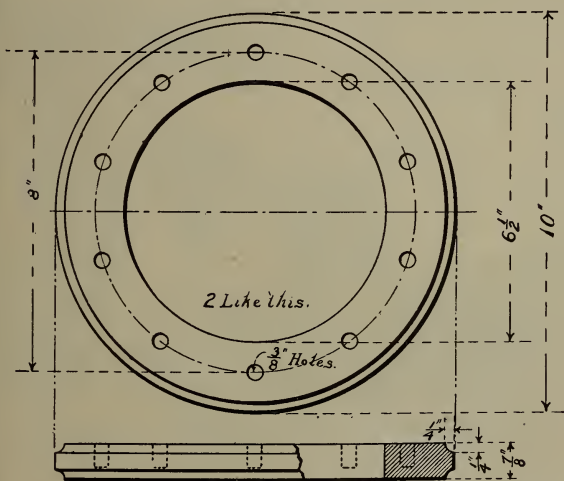
BLACKING CASE No. 2



A. W. Evans Del

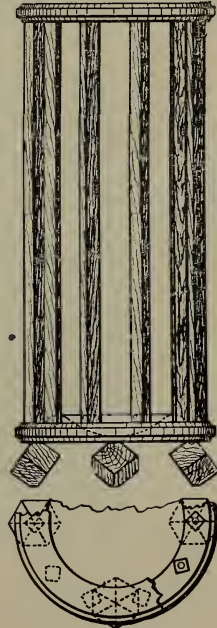


A. F. Beardsley



A W Evans. Del.

UMBRELLA STAND

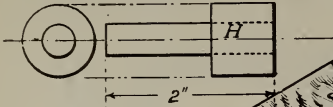


Wm P Hawley Designer.

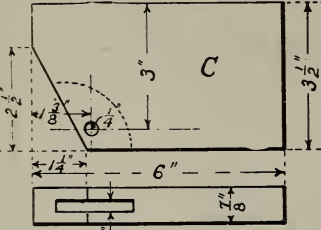
R. F. Beardsley.

DRAWING TABLE.

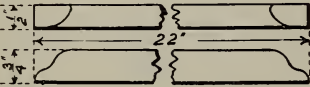
Dowel pin inserted in broomstick.



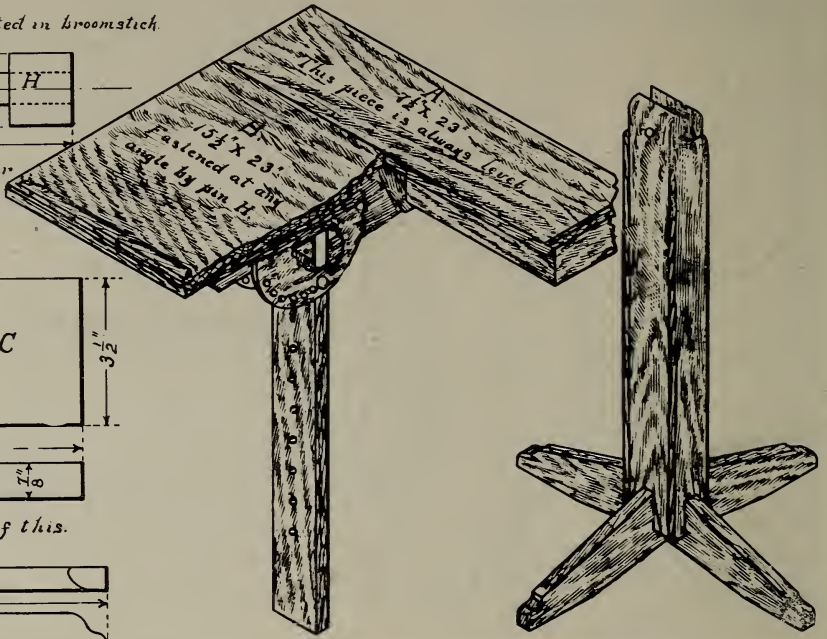
Two of this as per drawing, and one 1" longer.



One of this.



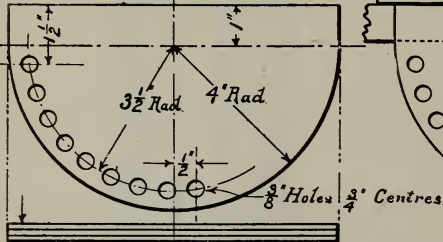
A W Evans Del.



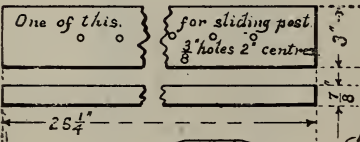
E. L. Valentine Designer.

H. F. Beardsley

DRAWING TABLE.

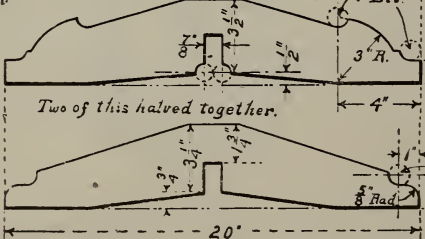


Two of this. Made of Q. S. Oak or of three pieces glued together.



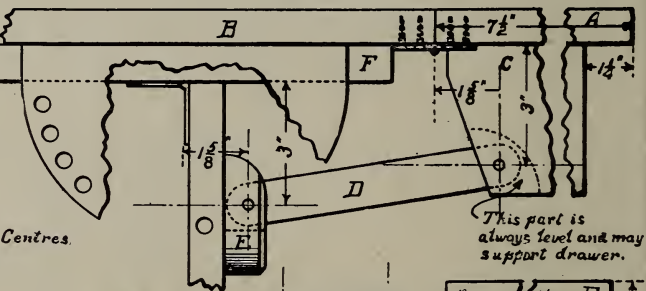
One of this.

for sliding post 3/8 holes 2" centres

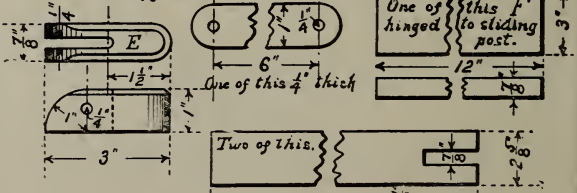


Two of this halved together.

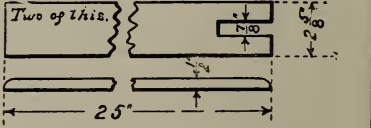
A W Evans Del.



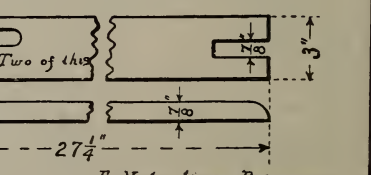
This part is always level and may support drawer.



One of this F to sliding post.



Two of this.



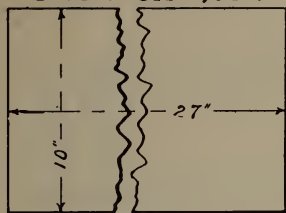
Two of this

Groove to receive E One piece not grooved at top.

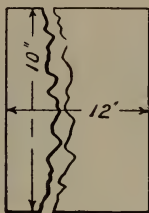
H. F. Beardsley.

E. Valentine Designer.

TOOL CHEST.

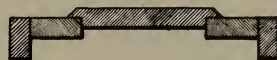
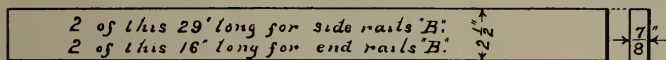
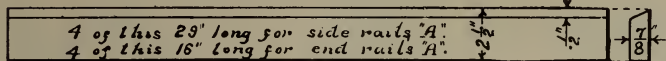
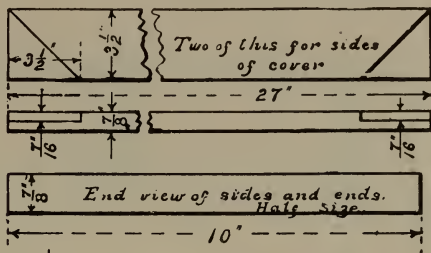


Two of this

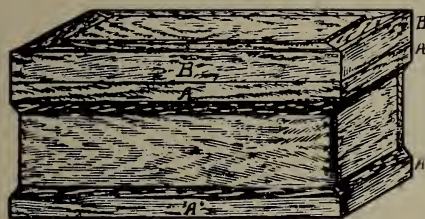


Two of this.

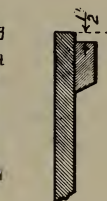
Glue together and fit on bottom.



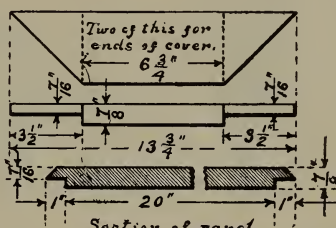
Section of cover.



Scale 3" = 12"



Section showing position of top rail.



Section of panel.

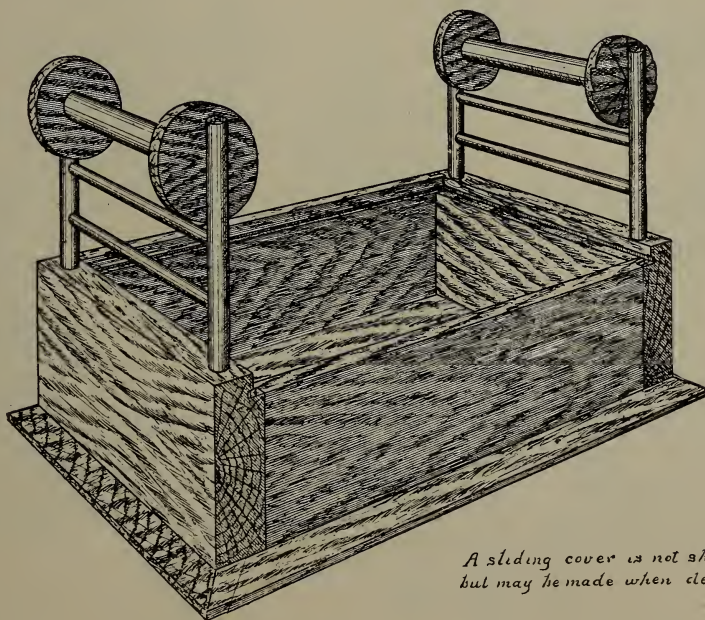
lengthwise.

Chas. S. Irons Designer.

A. W. Evans Del.

R. F. Beardsley.

LOOM NO. 2. SHEET 3.



A sliding cover is not shown, but may be made when desired.

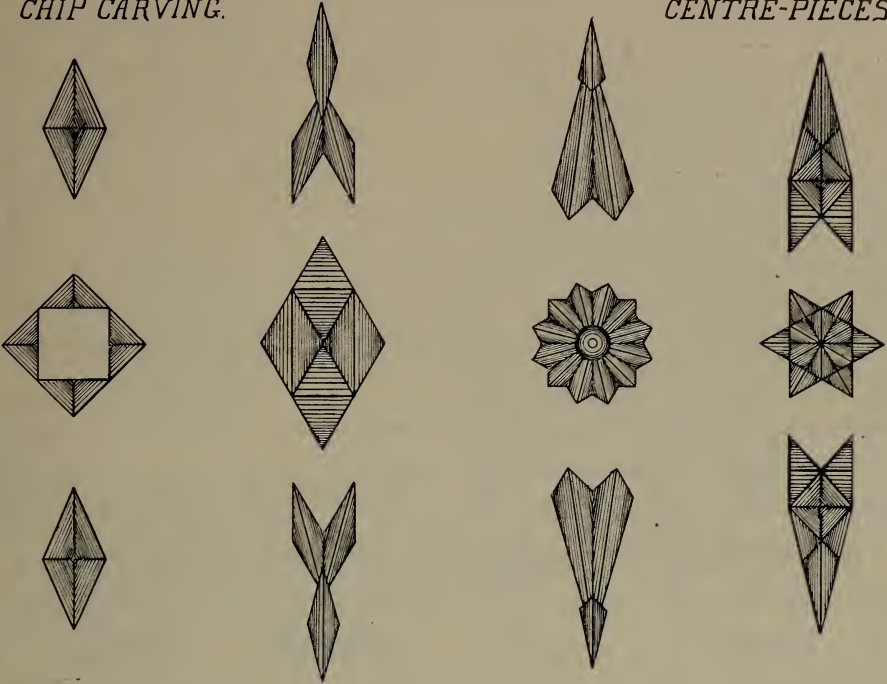
A. W. Evans Del.

R. F. Beardsley.

M. M. Friedman Designer.

CHIP CARVING.

CENTRE-PIECES.

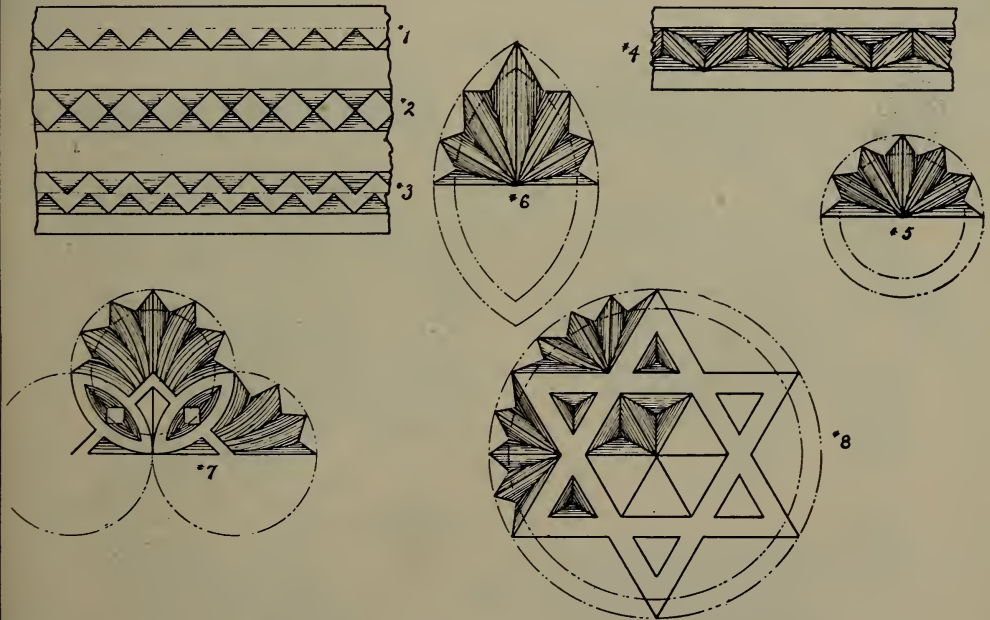


A. W. Evans Des.

A. T. Robinson Designer.

R. F. Beardsley

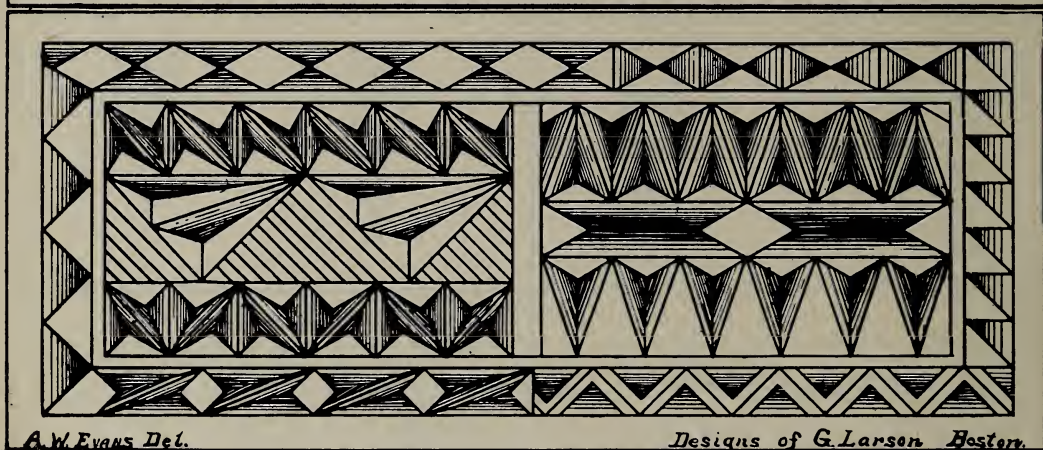
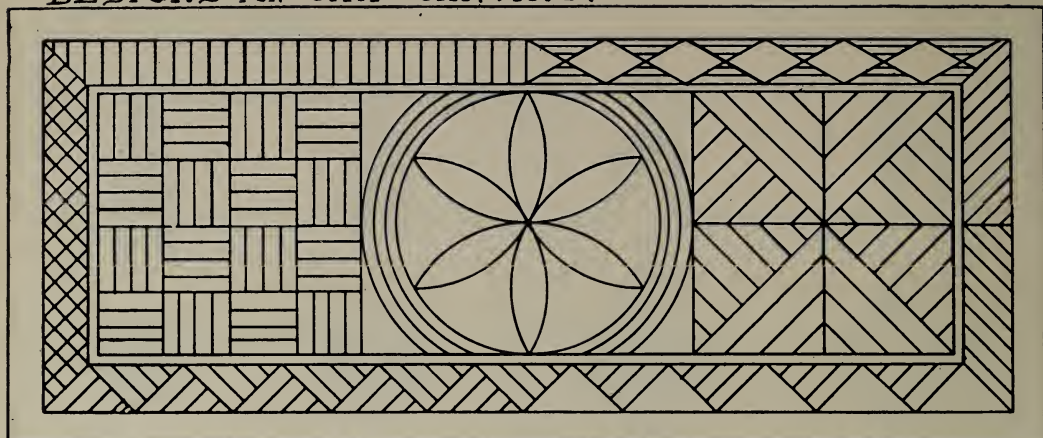
CHIP CARVING.



A. W. F. 1893. Des.

R. F. Beardsley.

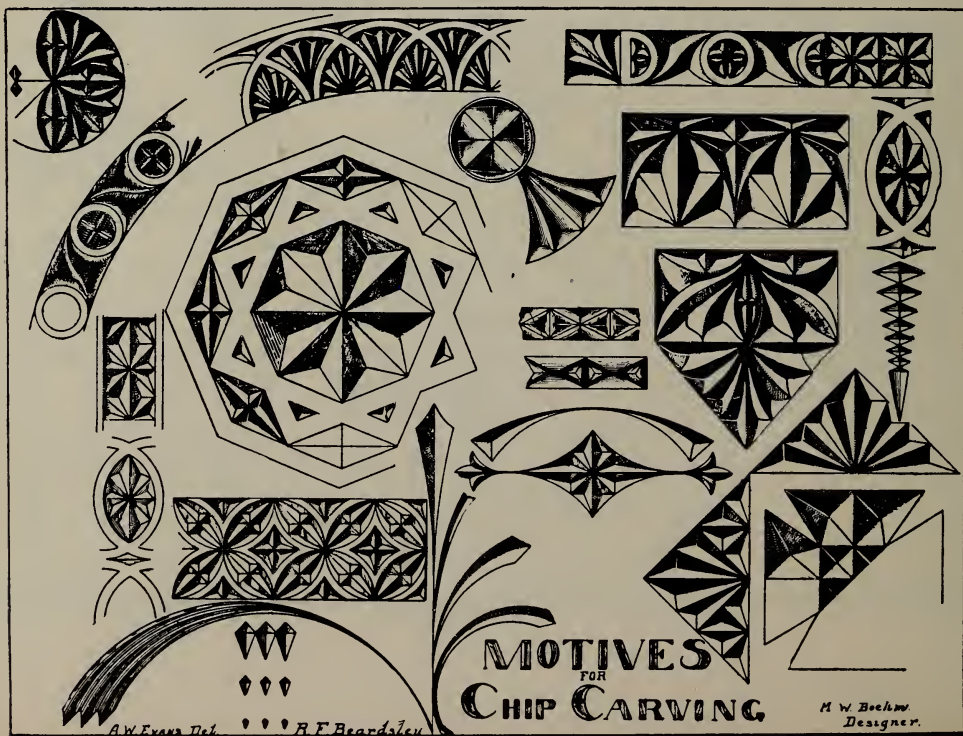
DESIGNS FOR CHIP CARVING.



A. W. Evans Del.

Designs of G. Larson Boston.

R. F. Beardsley

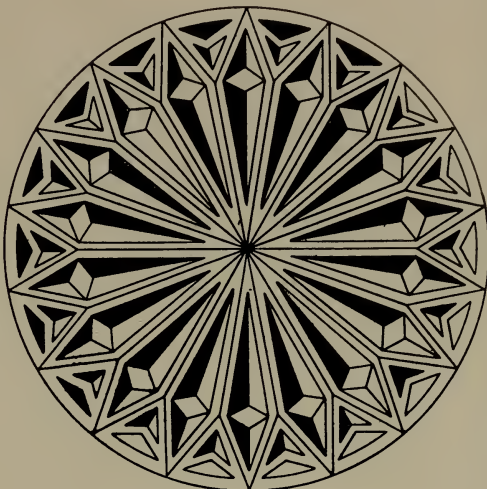


A. W. Evans Del.

R. F. Beardsley

MOTIVES
FOR
CHIP CARVINGM. W. Boehm
Designer.

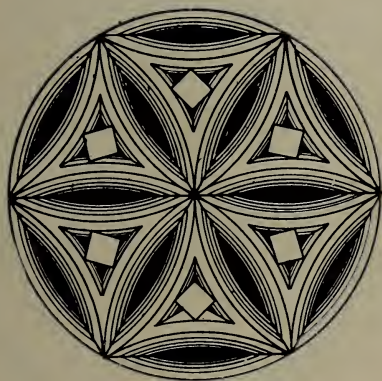
DESIGNS FOR CHIP CARVING.



Designs of G. Larson Boston Mass.

Evans & Robinson Dels.

DESIGNS FOR CHIP CARVING



Designs of G. Larson Boston

Evans & Robinson Dels.

DESIGNS FOR CHIP CARVING.



Designs of G. Larson Boston Mass.

Evans & Robinson Del's

H. F. Beardsley.

DESIGNS FOR CHIP CARVING.



Designs of G. Larson Boston.

Evans & Robinson Del's

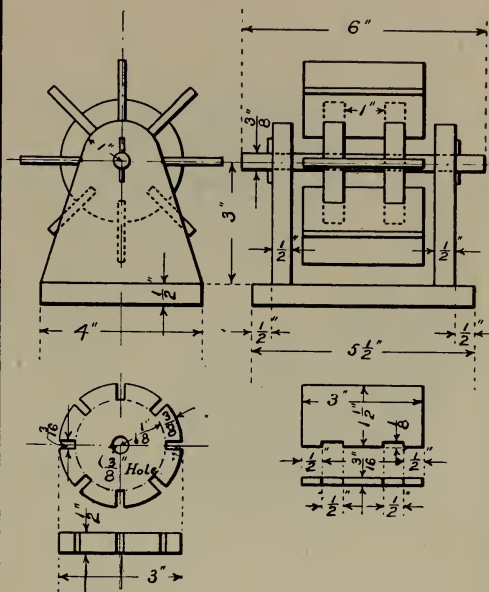
CHIP CARVING



Design of G. Larson Boston Mass

Evans & Robinson Dels.

WATER WHEEL. NO 1



H. W. Evans Des.

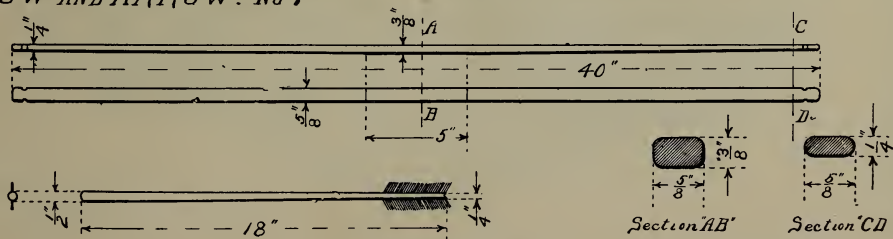
R. F. Beardsley

CHIP CARVING.



Design of Mr. G. Larson Boston.

BOW AND ARROW: NO 1



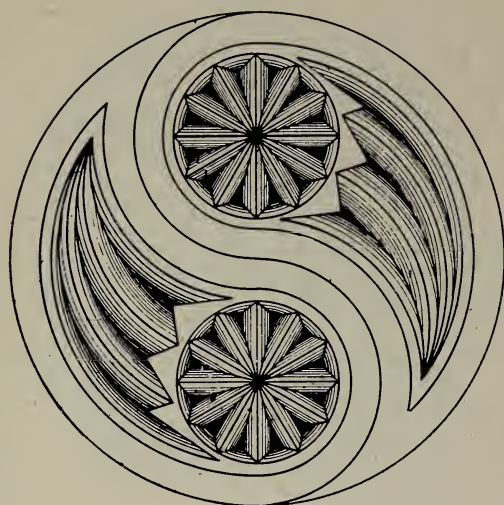
Small end to be sawn to receive feather then glued together again

Evans & Robinson Dels.

A. W. Evans Des.

R. F. Beardsley.

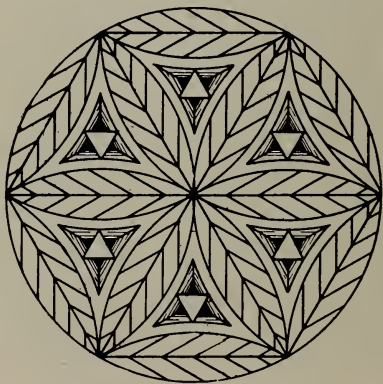
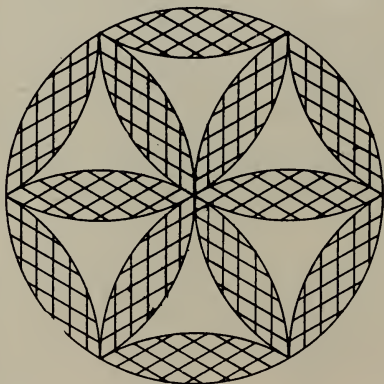
DESIGNS FOR CHIP CARVING.



Evans & Robinson, Dels.

Designs of G. Larson Boston Mass

DESIGNS FOR CHIP CARVING.



A.W. Evans Del.

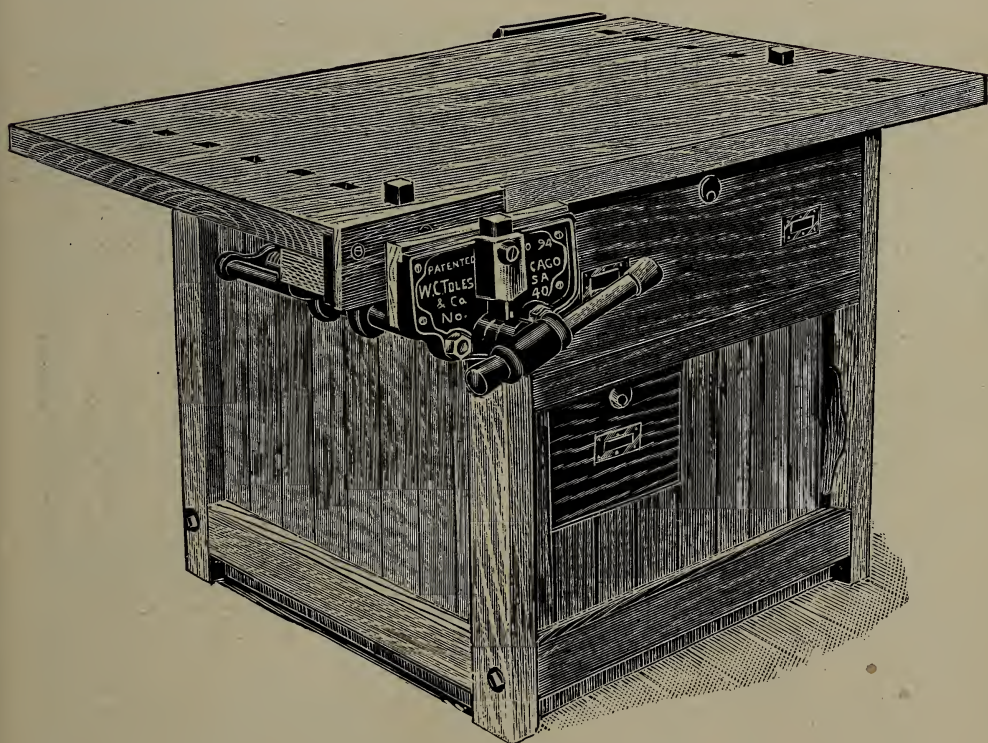
Designs of Mr. G. Larson
A.T.H.

R.F. Beardsley.

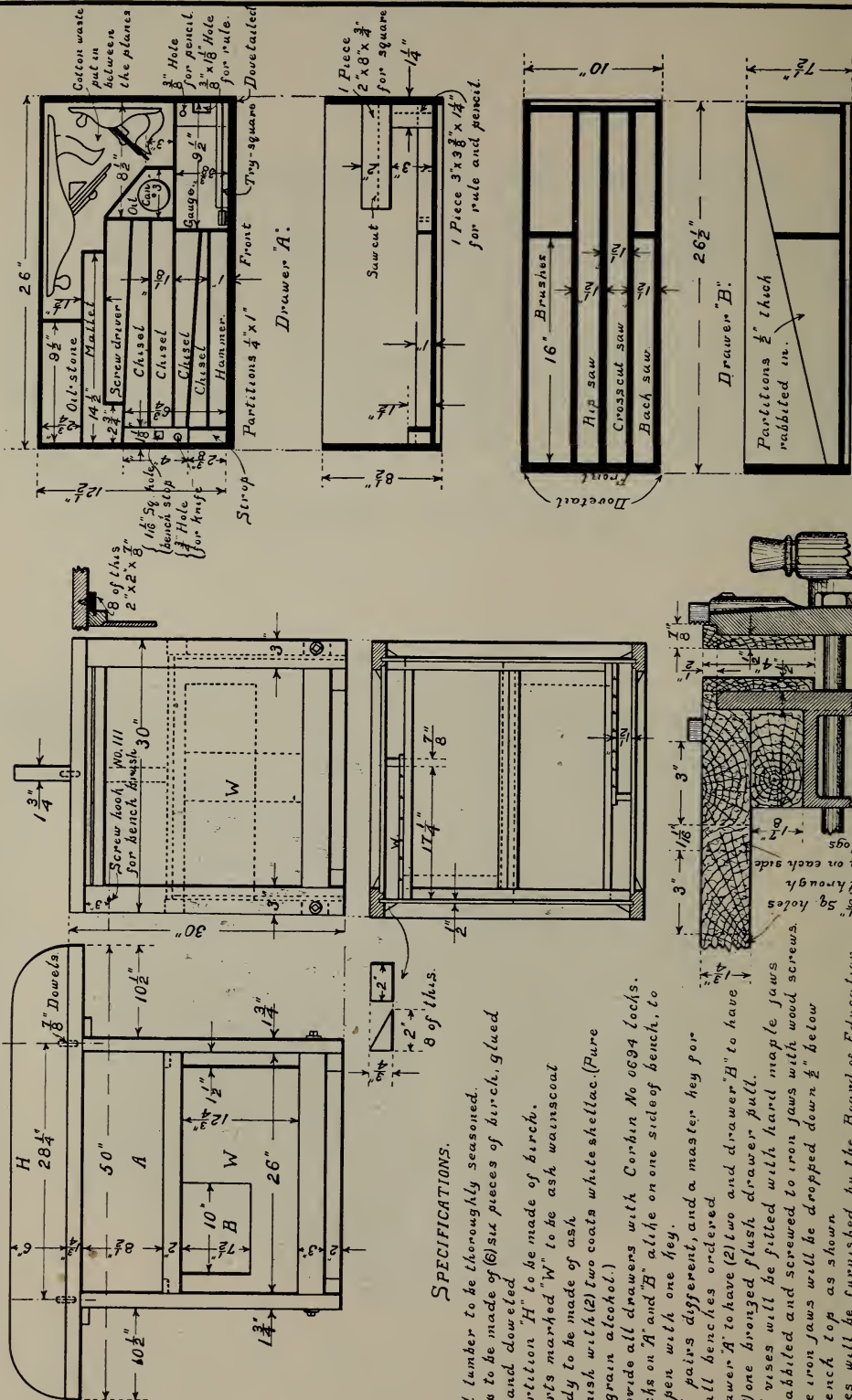
Designs for Equipment of A Manual Training Shop.

The following pages are devoted to designs for apparatus as used in the Grammar Grade Shops of the Chicago Public Schools.

TWO PUPIL BENCH.



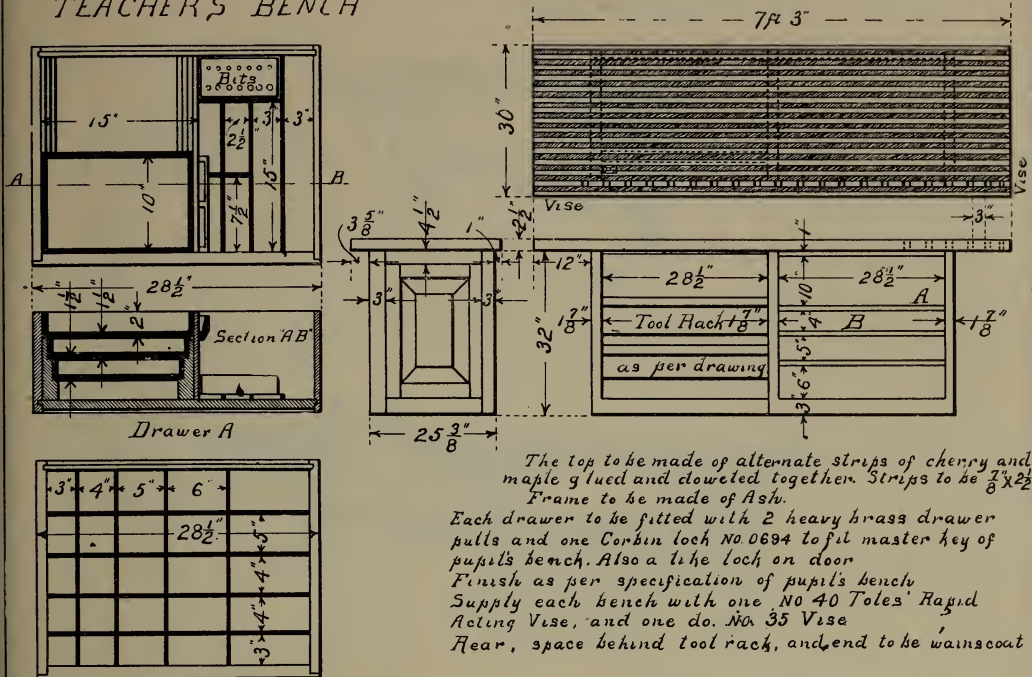
DOUBLE MANUAL TRAINING BENCH.



SPECIFICATIONS.

All lumber to be thoroughly seasoned.
 Top to be made of (6) six pieces of birch, glued and doweled.
 Partition "H" to be made of birch.
 Parts marked "W" to be ash waistscot.
 Body to be made of ash.
 Finish with (2) two coats white shellac. (Pure grain alcohol.)
 Provide all drawers with Corbin No 6394 locks.
 Locks on "A" and "B" alike on one side of bench, to open with one key.
 All pairs different, and a master key for all benches ordered.
 Drawer "A" to have (2) two and drawer "B" to have (1) one bronzed flush drawer pull.
 All vises will be fitted with hard maple jaws rabbited and screwed to iron jaws with wood screws. The iron jaws will be dropped down 1/2" below bench top as shown.
 Vises will be furnished by the Board of Education

TEACHER'S BENCH



The top to be made of alternate strips of cherry and maple glued and doweled together. Strips to be 2" x 2 1/2". Frame to be made of Ash.

Each drawer to be fitted with 2 heavy brass drawer pulls and one Corbin lock No 0694 to fit master key of pupils bench. Also a like lock on door.

Finish as per specification of pupils bench.

Supply each bench with one No 40 Toles' Rapid Acting Vise, and one do. No 35 Vise.

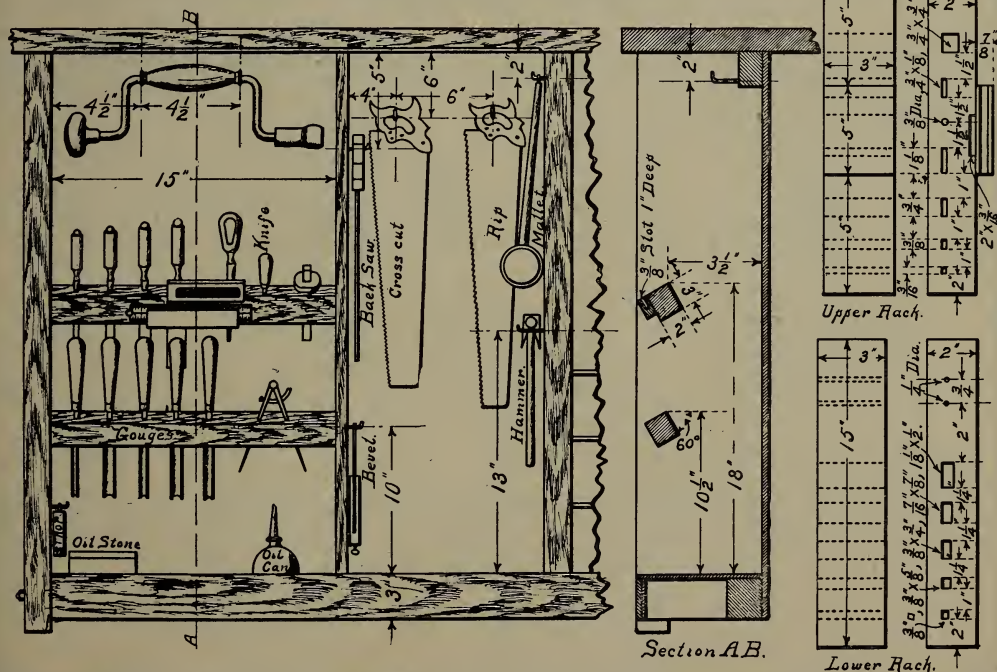
Rear, space behind tool rack, and end to be wainscot.

Drawer B.

A.W. Evans Del.

R. F. Beardsley

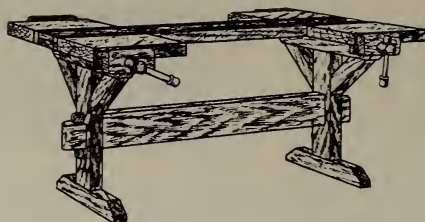
POSITION OF TOOLS ON TEACHER'S BENCH.



A.W. Evans Del.

R. F. Beardsley.

FOUR-PUPIL PRIMARY BENCH.



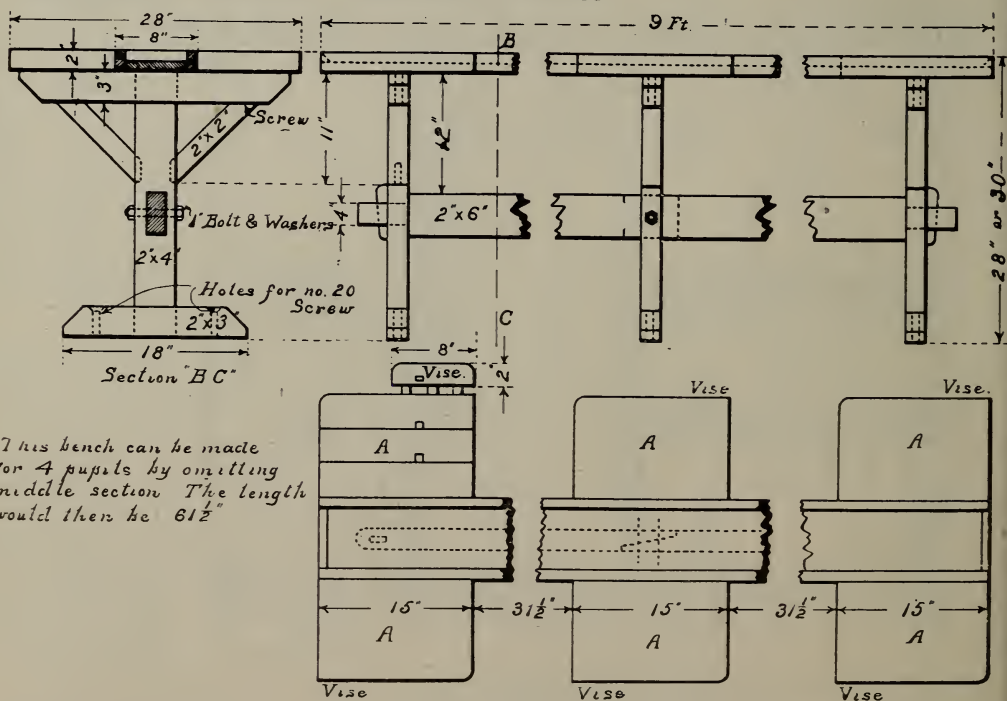
SIX-PUPIL PRIMARY BENCH.



A. W. Evans Del.

R. F. Beardsley

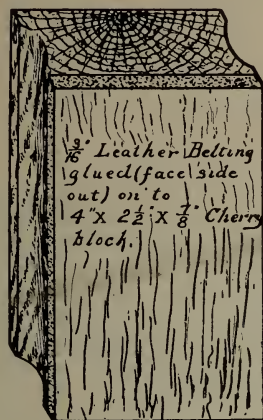
PRIMARY MANUAL TRAINING BENCH



A. W. Evans Del.

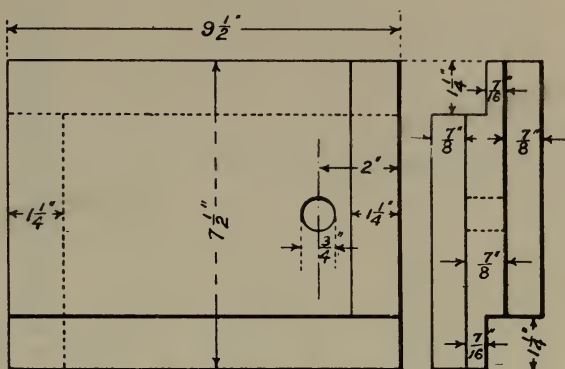
R. F. Beardsley

STROP.



A. W. Evans Del.

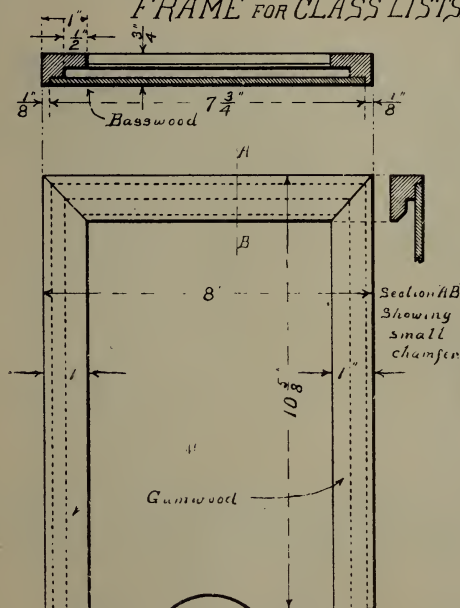
BENCH HOOK.



Make of hard maple.
Cleats to be doweled
and glued.
Finish with two coats
of white shellac.

H. F. Beardsley.

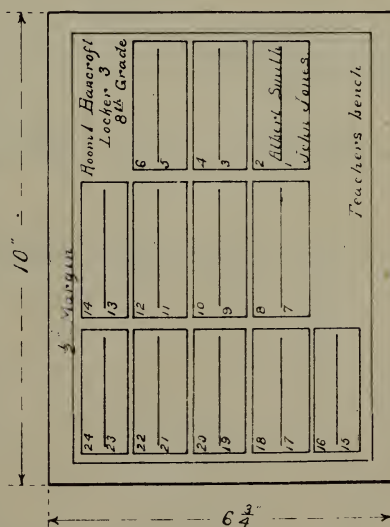
FRAME FOR CLASS LISTS



Basswood cut away to get
fingers under the lists

CLASS LIST.

One list for each class with name of
each boy at bench

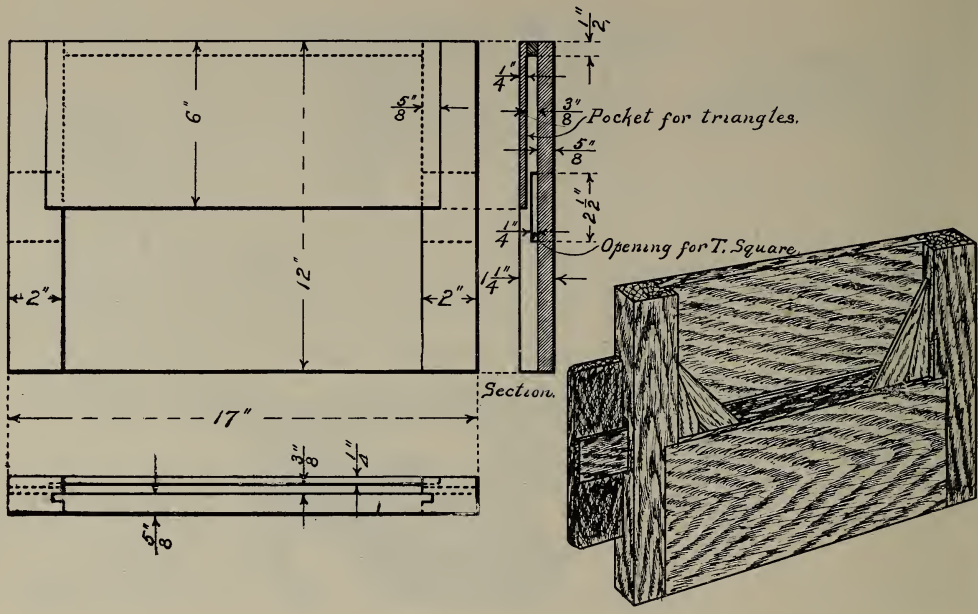


An ordinary drawing sheet cut in two.
Plan benches relative to teacher's bench.

A. W. Evans Des. and Del.

H. F. Beardsley

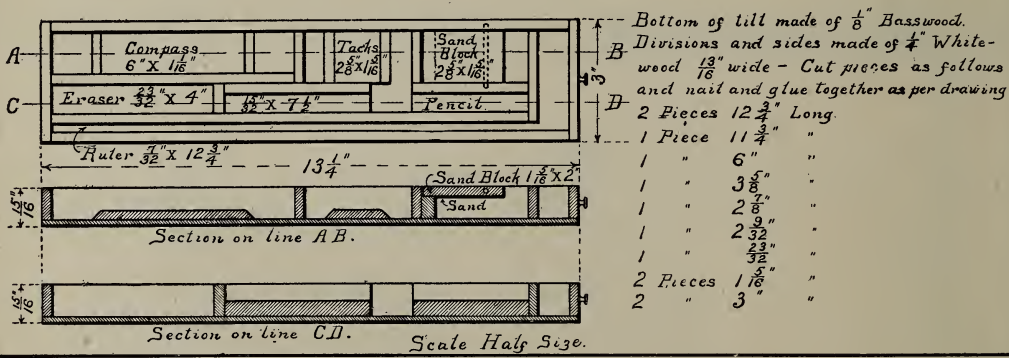
DRAWING BOARD.



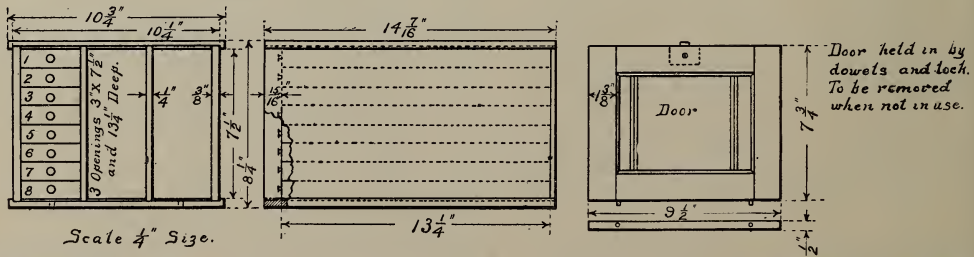
A. W. Evans Del.

R. F. Beardsley.

INDIVIDUAL INSTRUMENT TRAY.



CASE FOR 24 INSTRUMENT TRAYS.

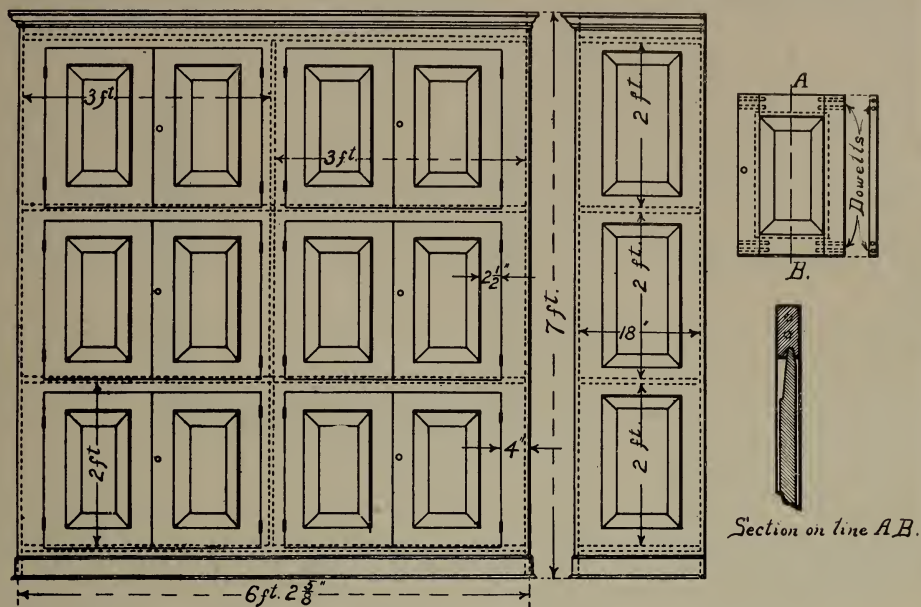


A. W. Evans Del.

R. F. Beardsley

Wm. P. Hawley Designer.

LOCKER CASE.

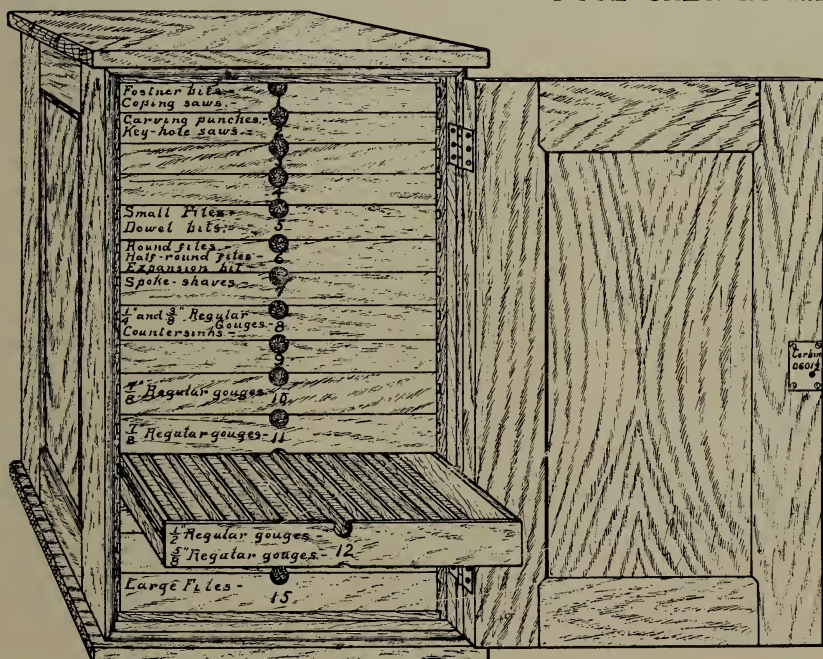


Provide Case with 6 locks Corbin No 0685 1/2 to fit masterkey of pupils bench.
 Also 6 elbow latches (spring No. 6300. Stock Ash.
 Finish with light filler shellac and one coat Waring Coach Varnish.
 This work to be guaranteed not to shrink or warp for one year.

A. W. Evans Del.

R. F. Beardsley.

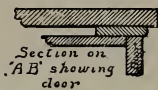
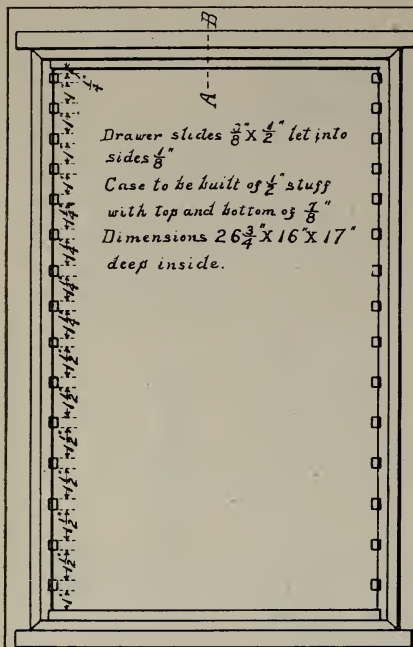
TOOL CABINET SHEET NO. 1.



A. W. Evans Del.

R. F. Beardsley

Wm. P. Hawley Designer



TOOL CABINET SHEET NO 2

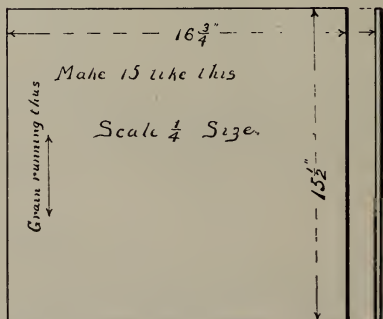
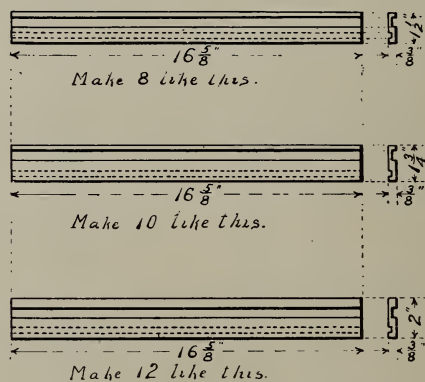
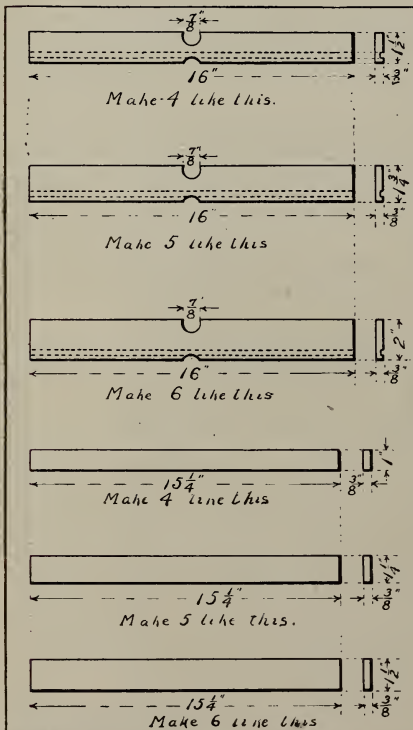
Scale $\frac{1}{4}$ Size.

A. W. Evans Del.

Wm P Hawley Designer.

R. F. Beardsley

TOOL CABINET SHEET NO 3

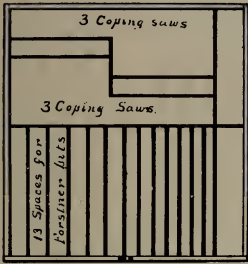


A. W. Evans Del.

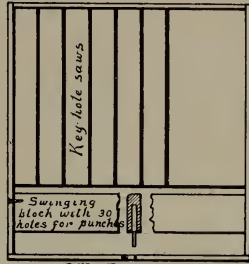
Wm. P. Hawley

R. F. Beardsley

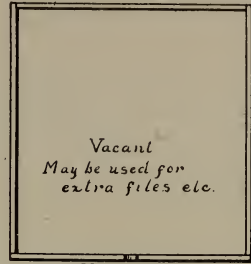
TOOL CABINET SHEET NO. 4



1st Drawer at top

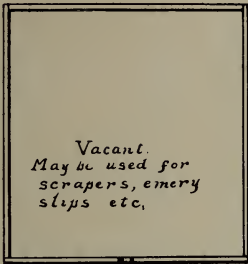


2nd Drawer



3rd Drawer.

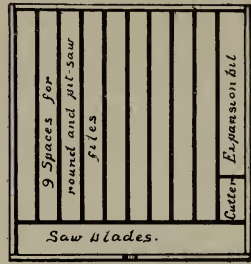
Scale $\frac{3}{16}$ Size



4th Drawer.



5th Drawer



6th Drawer.

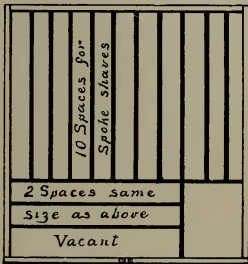
All portions in drawers are made of white wood strips $\frac{1}{4} \times \frac{3}{4}$.

A. W. Evans Del.

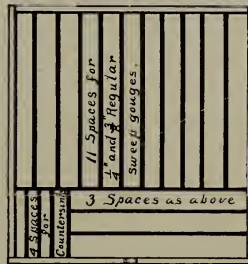
Wm P Hawley Designer.

R. F. Beardsley

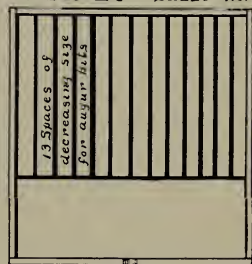
TOOL CABINET SHEET NO. 5.



7th Drawer

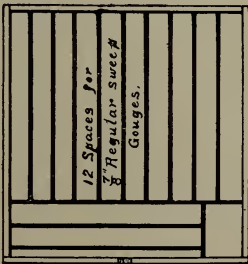


8th Drawer

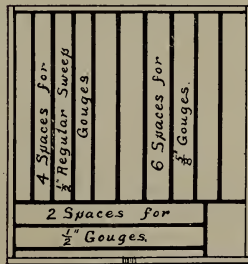


9th Drawer.

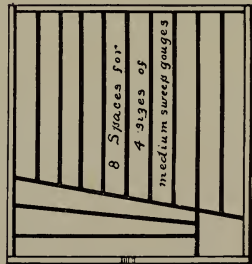
Scale $\frac{3}{16}$ Size.



10th and 11th Drawers.



12th Drawer



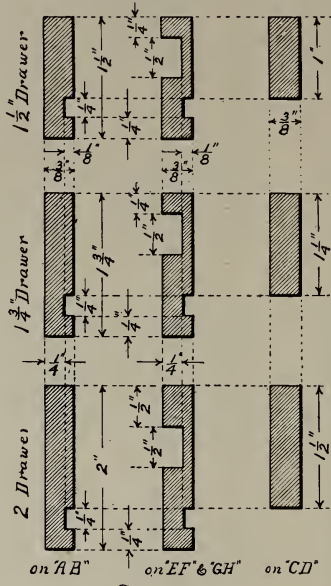
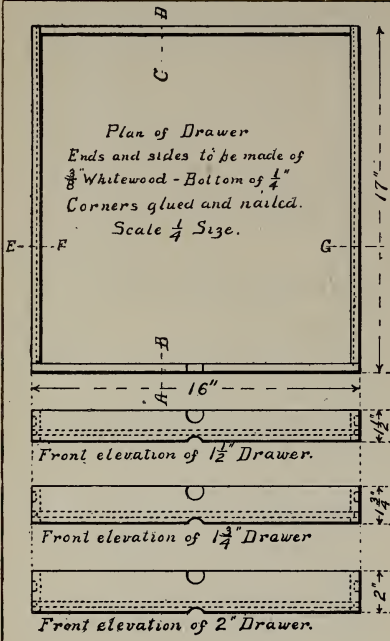
13th Drawer.

A. W. Evans Del.

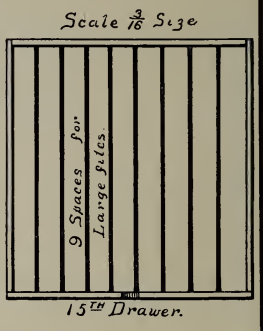
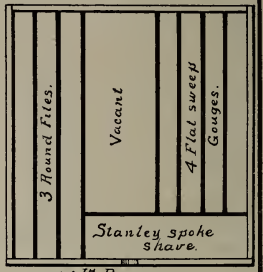
Wm P Hawley Designer.

R. F. Beardsley

TOOL CABINET SHEET NO 6



Sections.
Scale Full Size



A.W. Evans, Del.

R. F. Beardsley

Wm. P. Hawley, Designer.

Courses of Study.

The following are examples of courses of study arranged with the idea of consecutive advance in tool practice. The ideas of self expression or coördination are considered in only a superficial manner.

Four Year Course,

Begining in Fifth Grade.

	PAGE.
1. Plant Label, No. 1. or No. 2.....	10-12
2. Pencil Sharpener No. 1. or No. 2.....	10-12
3. Twine Winder.....	10-12
4. Match Scratcher.....	13
5. Bracket Shelf.....	13
6. Corner Shelf.....	13
7. Round Mat.....	17
8. Mat No. 2.....	15
9. Blotter.....	17
10. Match Safe No. 4.....	15
11. Envelope Opener.....	15
12. Pen Rack.....	17
13. Photograph Frame.....	23
14. Kite (if in season).....	20
15. Key Rack.....	21
16. Envelope Case.....	19
17. Coat Hanger.....	21
18. Paper Knife No. 1 or No. 3.....	24-25
19. Pen Holder.....	26
20. Nail Box No. 1.....	30
21. Whisk Broom Holder No. 1, or Comb and Brush Pocket No. 2.....	32-34
22. Book Rack No. 1.....	36

	PAGE.
23. Brack Shelf	38
24. Tipcat and Bat	43
25. Sand Paper Block or Blotting Pad.....	45
26. Picture Frame No. 3.....	48
27. Salt Box.....	51
28. Whisk Broom Holder No. 2.....	53
29. Hat Rack, or Weather Vane No. 1.....	56-57
30. Towel Roller.....	59
31. Sled.....	65
32. Pen Tray	67
33. Knife Box	71-72
34. Pencil Box	73
35. Picture Frame No. 2.....	48
36. Inlaid Hat Rack.....	77
37. Sugar Scoop	74
38. Glove Box.....	76
39. Window Box	Not shown
40. A choice of Tables, Tabourets, Tool Chest, or Cabinet	See Index

Three Year Course,

Beginning in Sixth Grade.

1. Plant Label, No. 1. or No. 2.	10-12
2. Pencil Sharpener, No. 1 or No. 2	10-12
3. Twine Winder	10-12
4. Match Scratcher.....	13
5. Bracket Shelf	13
6. Round Mat.....	17
7. Blotter	17
8. Match Safe No. 4.....	15
9. Envelope Opener.....	15
10. Pen Rack	17
11. Kite (if in season).....	20
12. Key Rack	21

	PAGE.
13. Envelope Case	19
14. Coat Hanger	21
15. Paper Knife No. 1. or No. 3.....	24-25
16. Nail Box, No. 1.....	30
17. Bracket Shelf	38
18. Tipcat and Bat	43
19. Sand Paper Block, or Book Rack, No. 2.....	45
20. Picture Frame No. 3.....	48
21. Salt Box.....	51
22. Whisk Broom Holder, No. 2.....	53
23. Towel Roller	59
24. Sled	65
25. Pen Tray.....	67
26. Knife Box.....	71-72
27. Inlaid Hat Rack	77
28. Sugar Scoop	74
29. Window Box.....	Not shown
30. A Choice of Tables, Tabourets, Tool Chest or Cabinet.....	See Index

Two Year Course,

Beginning in Seventh Grade.

1. Plant Label No. 1, or No. 2.....	10-12
2. Pencil Sharpener, No. 1, or No. 2.....	10-12
3. Twine Winder	10-12
4. Match Scratcher	13
5. Round Mat	17
6. Envelope Opener	15
7. Pen Rack	17
8. Kite (if in season)	20
9. Envelope Case	19
10. Coat Hanger	21
11. Paper Knife No. 1, or No. 3.....	24-25
12. Tipcat and Bat	43

	PAGE.
13. Book Rack No. 2.....	47
14. Picture Frame No. 3.....	48
15. Whisk Broom Holder No. 2.....	53
16. Towel Roller.....	59
17. Sled.....	65
18. Pen Tray.....	67
19. Sugar Scoop.....	77
20. A choice of Tables, Tabourets, Tool Chest or Cabinet	See index

One Year Course,

Beginning in Eighth Grade.

1. Twine Winder.....	10-12
2. Round Mat.....	17
3. Match Safe, No. 4.....	15
4. Envelope Opener.....	15
5. Envelope Case.....	19
6. Coat Hanger.....	21
7. Paper Knife, No. 1, or No. 3.....	24-25
8. Nail Box, No. 1.....	30
9. Tipcat and Bat.....	43
10. Picture Frame, No. 3.....	48
11. Towel Roller.....	59
12. Sled.....	65

Coördination.

The following is a tentative course of Study for Manual Training classes arranged in accordance with the idea of coördination with the class room work.

EIGHTH GRADE.

September and October.

I. WEATHER VANE: 2. BOX KITE: *Study*, weather maps, winds, clouds, evaporation, condensation, radiation, temperature.

November and December.

I. SLED: (to be finished before December 25th). *Study*, rain, snow, barometer, modes of locomotion and the development of transportation facilities. Describe life in a logging camp, and methods of felling, transporting and converting timber.

SEVENTH GRADE.

September and October.

BOW AND ARROW: *Study*, primitive man and his weapons, and the development and growth of arms and armament. In connection with feathering the arrow, study birds, their plumage and flight. Also study the mathematics of projectiles within the comprehension of the pupils, and the laws of gravity and falling bodies.

November and December.

LOOM: *Study*, textiles, animal and vegetable fibres, bi-products of wood.

COMPASS: *Study* latitude and longitude, static and dynamic electricity, magnetism, (illustrate by experiment.)

SIXTH GRADE.

September.

OCTAGONAL MAT: (Ornamented with a leaf stamped with a carving punch.)

Study direction and relation of lines, angles, polygons, etc., (see course of study p. p. 17.)

In connection with the leaf ornament, teach as per course of study p. p. 28.

October.

LETTER OPENER: (chip-carving ornamentation.)

Study, distribution of mail, the use and meaning of stamps, taxes, postal regulations, etc.

Teachers should thoroughly prepare themselves to present the topics under the head of *study*, in a clear and attractive form. In order to better understand the working of such related constructive courses, and to more fully develop this system, each teacher is requested to give the course here shown to one class in each grade during the present year, and to still further develop it to cover the entire school year.

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Supplement

Prepared by MR. GRANT BEEBE.

INSTRUCTION ON TOOLS.

After the pupils have been assigned to their benches it is desirable that they should clearly understand just what is expected of them in the matter of conduct. On account of the novelty of their surroundings in the shop, many pupils are likely to be disorderly, who would not be so, if they knew what was expected of them. The following suggestions have been found of value in overcoming this difficulty. They may either be given orally by the teacher or in case a note book is kept they should be the first entry made. In that case they should be dictated by the instructor.

I

Remain at the bench assigned to you always, unless given permission to leave it.

2

When you come into the shop you should go to your bench and stand at the middle of it facing the teacher while he reads the names of the members of the class.

Answer to your own name when it is read.

3

After the names are read you should inspect your bench and tools. See that you have all the tools and that they are in the proper places. If any tool is broken or missing you should let the teacher know at once. If you do not do so you will be held responsible. You should also see that all the tools that you are going to use are sharp. If they are not report to the teacher.

4

When you have looked over your tools you will receive your work, but you are not to begin work until told to do so.

5

Never do any talking or communicating in the shop unless you receive permission to do so.

6

When you need to use glue, shellac, or varnish go to the table or shelf to do so. Each can is labeled so that you can tell what is in it. Be careful to put the brushes into the same can in which you found them.

7

In case any tool does not work well and you can not fix it, let the teacher know at once.

Having given the preceeding instructions let the pupils at once familiarize themselves with the bench and tools. The first object that will attract their attention is the vise. Explain its action and show how to open and close it *quietly*. If this is insisted upon at first much trouble will be avoided. After the vise take up the tools in order calling attention to the place where each is kept. If possible get the pupils to give the names of the tools. If not tell them the names. Too much stress can not be laid on this point as it is impossible to give instructions unless the pupils have the names of the tools fixed in their minds.

Having let the pupils become familiar with the tools and the places where they are kept some slight instruction should be given on the material to be used. It is not desirable to give extended instruction at this point but the name of the kind of wood used should be given and the meaning of the word grain clearly defined as suggested below.

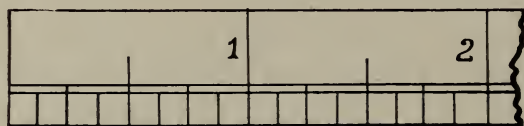
WOOD.

NOTE.—The kind of wood used is white pine (or whatever wood is employed.) It belongs to the class known as soft woods. The grain of wood is due to the direction in which the fibres grow in the tree. Wood always splits in the direction of the grain:

DIRECTIONS:—The teacher should illustrate this by splitting a small block or better provide each pupil with a block and let him investigate for himself.

THE RULER.

FIG. 1.

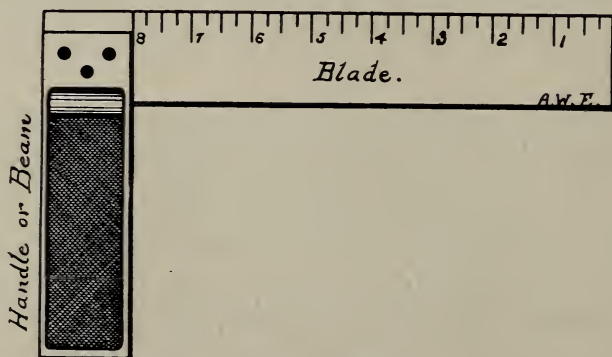


NOTE.—The carpenter's ruler is twenty-four inches long and each inch is divided either into eighths or sixteenths.

DIRECTIONS:—The teacher should place on the black board a large sketch similar to Fig. 1. and should divide the inches before the class, who may compare with their rulers. Make clear the point that the ruler measures *spaces* and to make sure that this is understood ask questions such as: How many *lines* mark one inch? two inches? three eighths? etc. Also have pupils read from the black board drawing.

NOTE.—The square is used to determine whether two surfaces make a right angle (or an angle of 90°) with each other. The names of the parts of the square are given below.

FIG. 2



DIRECTIONS:—Define a right angle and make sure that the pupil understands what an angle is. Make clear the difference between the geometrical square and use of the word in mechanics. Draw on the board a square and any other rectangle and show that in the sense that the word is used in the shop the rectangle is also "square".

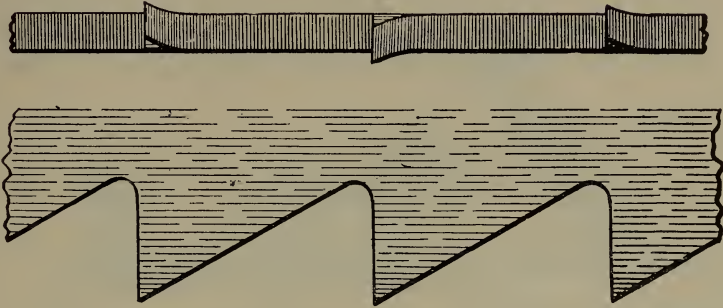
SAWS.

NOTE.—The shape of the teeth of a saw determines the use to which the saw is put.

RIP SAW.

NOTE.—The Rip Saw is used to cut in the direction of the grain. The shape of the teeth of the rip saw is given below.

FIG. 3

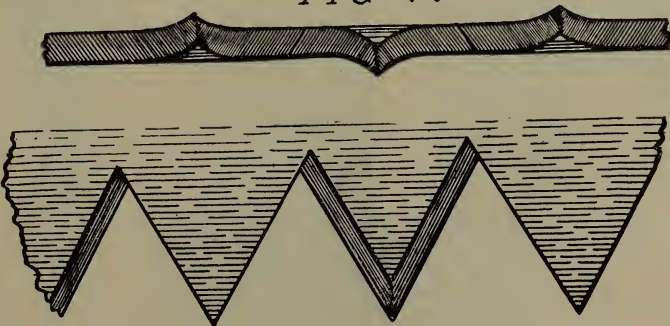


DIRECTIONS.—The teacher should have a wooden model which has teeth not less than three inches on the front side and which the pupils can compare with the teeth on their rip saws. The model should show the set very plainly. The rip saw cuts as a chisel does and the teacher should illustrate with a chisel and saw, showing that the shaving from the chisel is similar to the particles of saw dust from the saw.

CROSS CUT SAW.

NOTE.—The Cross Cut Saw is used to cut across the grain. The teeth are shaped like this:

FIG 4.



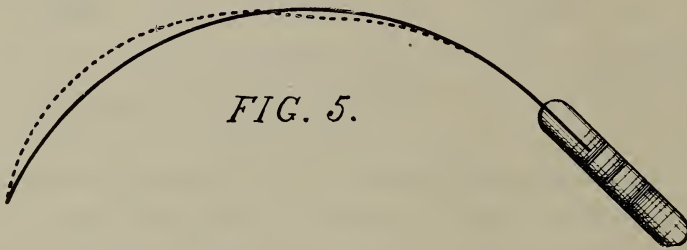
The cross cut saw is sometimes called the panel saw.

DIRECTIONS.—The teacher should illustrate with wooden

model as before. If possible have the pupils draw the teeth on the black board from their own saws before showing them the model. This training of the observation is important. The action of the cross cut saw is that obtained by the use of a knife and chisel. The sharp edge of the tooth cuts the fibres and the upper part pushes them from the cut. Illustrate with knife and chisel.

Both saws are narrower at the point than at the handle to make them cut more near the handle than at the point. The narrow point also enables the user to straighten a crooked cut. (Illustrate.)

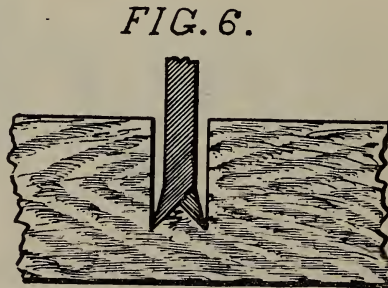
NOTE.—If a saw bends in an even curve from handle to point it shows that the blade is of uniform temper and evenly ground.



If the saw is poor it will bend unevenly as shown by the dotted line. A good saw should spring back into a straight line after being bent.

SET OF SAWS.

NOTE.—The teeth of every saw are bent from side to side so that the cut will be wider than the thickness of the blade and the blade will pass easily through the cut. This bending is called the "Set".

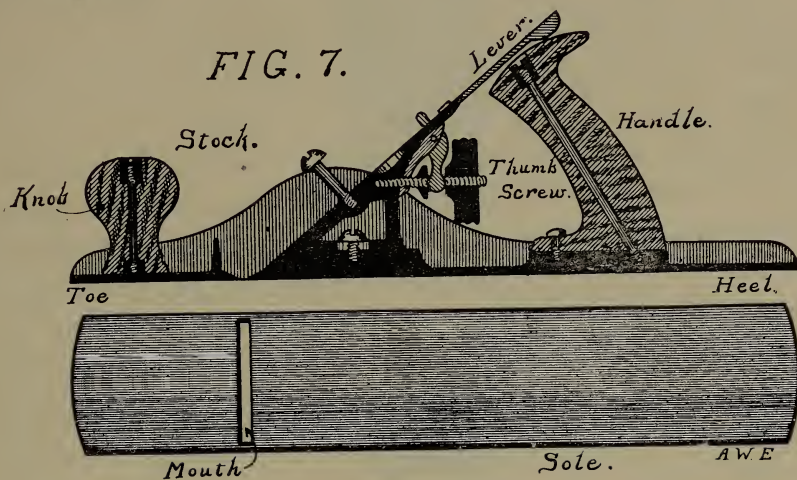


BACK SAW.

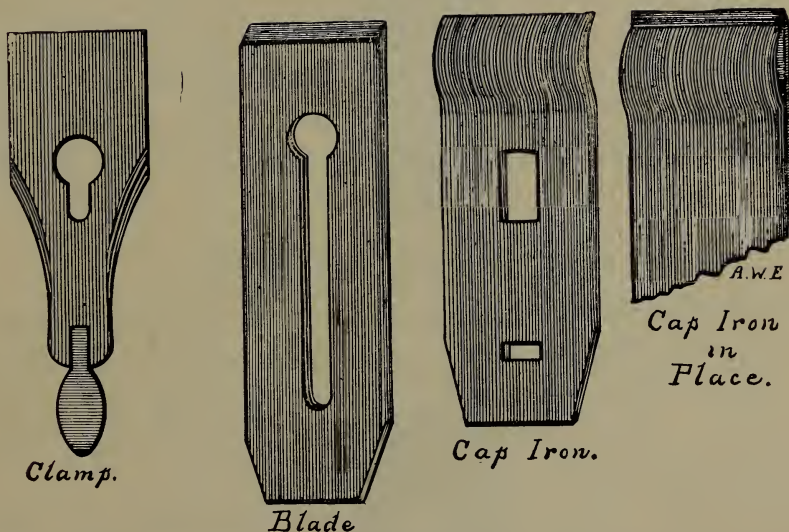
NOTE.—The Back Saw is so called on account of the steel back put on it to stiffen the blade. It is sometimes called the tenon saw and is used for short fine cuts.

PLANES.

NOTE.—The plane is generally used to make a flat, or plane surface. The names of the principal parts of the plane are given below.



8.



The clamp is to hold the blade and cap-iron in place.
The Cap-iron is to break off the shavings.

The Thumb Screw is to push the blade out or in.

The lever is to bring the edge of the blade parallel with the face of the sole.

The blade does the cutting and *must be kept sharp*.

DIRECTIONS.—Have the pupils take their planes, (preferably the jack plane on account of its large size) and remove the clamp, blade and cap iron. Give them the names of the stock and its parts as shown in the sketch. Let them see the operation of the lever and thumb screw. Call attention to the different materials used in the stock and the reason for selecting them. It will not be possible in the majority of classes to have the sketch made from the plane but Fig. 7. should be placed on the black board and the names put where they belong, a sketch should also be made showing the manner in which the cap-iron turns the shavings and breaks them off. In regard to the piece called the clamp there seems to be a difference of usage. I have adopted the word clamp because it prevents confusion and more nearly describes the action of the piece than any other single word. The cap-iron is universally called by this name but the blade is variously called the cutter, bit, plane iron, etc. I have adopted the word blade because it seems to convey the idea of the use of this piece more clearly than any other word. I object to the use of the words plane iron as being inaccurate and likely to confuse the pupil. Explain the difference between the wrought iron of which the cap iron is made and the steel of which the blade is made.

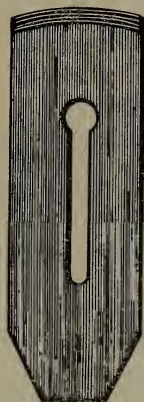
KINDS OF PLANES.

NOTE.—The most common planes are the Jack Plane and the Smoothing Plane. These are used to plane in the direction of the grain. There is a plane used for planing across the end of the grain. This plane is called the Block Plane but the smoothing plane may be used for this purpose.

DIRECTIONS. The teacher should illustrate the different cuts with the plane and particularly the effect of planing against the grain.

NOTE.—The Jack Plane is made for rough work and so it is ground to take a thick shaving. The edge of a jack plane should round slightly like this.

FIG. 10.



NOTE.—The Smoothing Plane is used to make a smooth surface. The blade is therefore ground straight across like this.

FIG. 9.



SHARPENING PLANES.

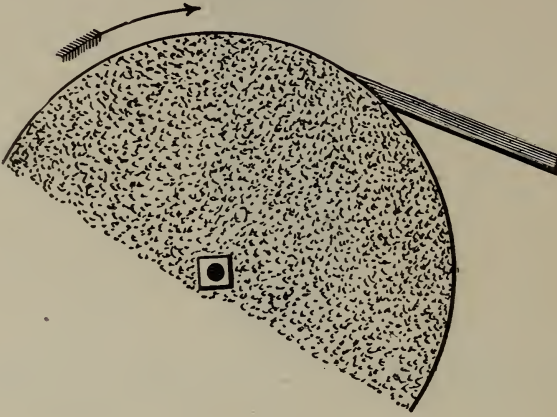
NOTE.—If the blade of a plane has its edge injured like this

FIG. 11.



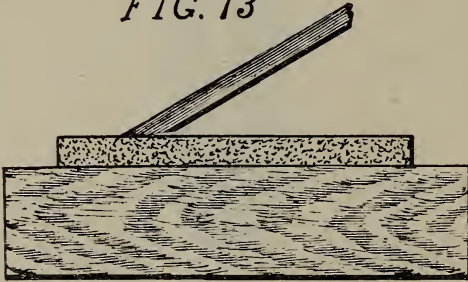
it must be ground on the grindstone. The little notches in the blade are called "nicks" and the blade must be ground until they disappear. In placing the blade on the grindstone it must be held on the stone so as to make an angle of about 30° like this.

FIG. 12.



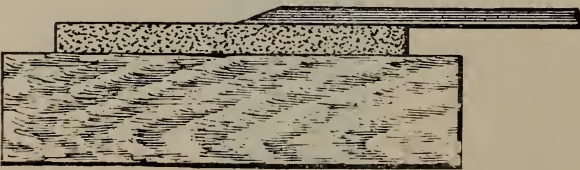
After grinding on the grindstone the edge of the blade is too rough to use and it must be rubbed on the oil-stone. First rub the newly ground or slanting face. To do this the blade must be held slanting as shown in the sketch.

FIG. 13



When the slanting side has been rubbed there will be little particles of steel forming a burr on the flat side. This must now be rubbed and the blade must be held flat as shown.

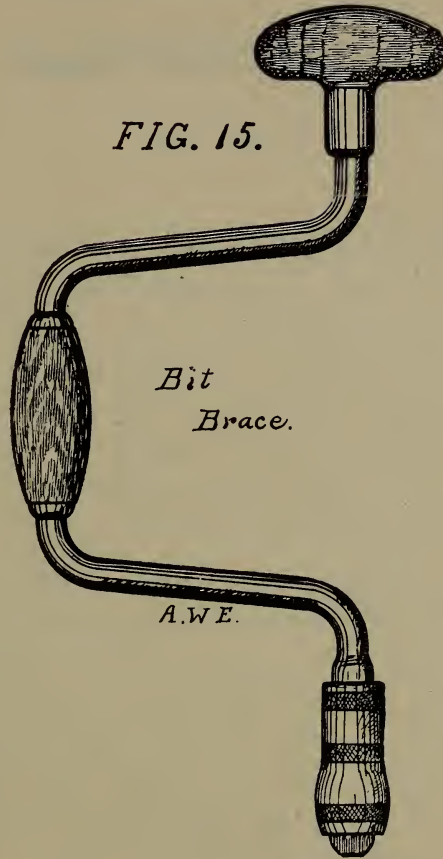
FIG. 14.



After the blade has been made as sharp as possible on the oil-stone it must be stropped on the block covered with leather provided for that purpose.

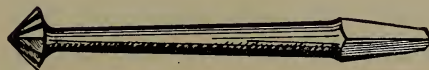
BORING TOOLS.

NOTE.—The tools used for making holes are the brace and bit. The brace or bit stock is shown below.

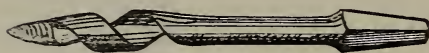


There are a large number of different kinds of bits used for various purposes, the most common of which are given below.

FIG. 16.



Countersink.

*Auger Bit.**Screw Driver Bit.**Gimlet Bit.*

THE HAMMER AND MALLET.

Pupils are apt to use these tools interchangeably and they should be made to understand the use of each at once. The hammer should be carefully examined and the following points brought out. Shape and use of the claw. Reason for the rounded face. Reason for the shape of the handle. Great stress should be laid on the proper handling of the hammer as pupils nearly always hold it to near the head.

The foregoing paragraphs cover the points that it is desirable to emphasize but the teacher should be familiar with the more extended treatment given in the books of reference. Special tools as the rabbet plane etc., should be explained as used. It has been found that a very good method of impressing the points on the pupils is to give the instruction as outlined at first orally and at the next lesson dictate the portions marked "Note". This will teach the pupils the spelling of the names of the tools and the other words that are unusual. The sketches given should be made as far as possible from the object, but where the sketch is too difficult as in the case of the section of the plane the pupil should copy the teachers sketch which should be put on the black board. All the sketches given should be put on the black board by the teacher and if note books are not kept the sketches should be

left on the board as long as possible in order to familiarize the pupils with the spelling and form of the terms. A very good method of review is to let the teacher in charge of the room from which the pupils come, give Manual Training or a like subject for a composition.

This will make the pupil formulate his ideas, review his spelling etc., and secure better coördination between the work of the shop and that of the regular school room.

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"Ho, all who labor, all who strive!
Ye yield a lofty power!
Do with your might, do with your strength,
Fill every golden hour!
The glorious privilege to DO
Is man's most noble dower."